BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLIII 1911 No. 9

THE PLEISTOCENE GLACIATION OF NORTH AMERICA VIEWED IN THE LIGHT OF OUR KNOWLEDGE OF EXISTING CONTINENTAL GLACIERS*

BY

WILLIAM HERBERT HOBBS

Until near the middle of the last century, interest in the scientific study of glaciers can hardly be said to have existed. Attention was first attracted to the subject in 1840 and 1841 by the appearance of monographs written by Agassiz and Charpentier and dealing with the glaciers of the Alps. The interest aroused was even then less because of the glaciers themselves than for the reason that Agassiz on the basis of his studies founded a new and highly attractive theory of origin for the so-called "drift" of the Alpine foreland and Northern Europe.

The vast ice mantle which he thus pictured in imagination as at one time spread over Northern Europe was tens of thousands of times larger than any glacier which he had seen, and must obviously have presented but few points of resemblance to the puny glaciers of Switzerland, but it was none the less clothed throughout with identical attributes.

It is one of the interesting coincidences of science that almost at the moment when Agassiz was hypothecating the great Pleistocene ice sheet of Northern Europe, the greatest of existing continental

* An address delivered before the Indiana Academy of Science at its annual meeting in Terra Haute, May 12, 1911.

glaciers was being independently approached by no less than three great exploring expeditions sent out under American, French, and English auspices. Although Wilkes, Dumont d'Urville, and Ross, all arrived at the margins of the great Antarctic ice sheet, no one of them set foot upon it; and thus the conception of earlier continental glaciers took definite shape before any existing example had been studied. To-day, three-quarters of a century later, with the newly acquired data of the Nordenskiölds, Nansen, von Drygalski, Scott and especially of Peary and Shackleton before us, it becomes necessary to recast all the traditional notions concerning continental glaciers, modelled as these have been upon the Alpine glacier type.

Let us, then, start afresh and, with all the available light of the present, consider the known types of existing glaciers; for as Sir Charles Lyell has so well said, "The present is the key to the past."

In order that glaciers may develop it is necessary that snow should accumulate in quantity greater than that which anywhere falls within the limits of a single season. More snow must, therefore, be precipitated than can be melted, and a residue must in the average year be left over to be added to accumulations of succeeding seasons. Wherever this condition exists, small glaciers are certain to be formed; for, unless melted, the snow accumulates until by its weight lower layers are transformed into ice, which under the influence of gravity moves down into lower levels until melting puts a stop to further extension.

The source of the snow by which glaciers are nourished, is in all cases the moisture carried in the atmosphere; though, as we shall see, the changes which this moisture undergoes before it is delivered to the glacier are notably different in the case of continental glaciers from what they are in other types. All the remaining types owe their existence and continued nourishment to the presence of an upland area which, being in the path of moisture-laden surface winds, has forced these air currents to rise and deposit their moisture in the form of snow. In contrast to continental masses of ice such glaciers may all be included under the name *mountain glaciers.*

It is a little difficult for one who has not given attention to thermodynamics to understand why the mere rise of air currents should compel them to deposit their moisture, but this may be made clear by homely illustrations.

First of all, it may be stated that the capacity of air to absorb moisture increases with its rise of temperature, and is decreased correspondingly when fall of temperature occurs. The air of a room twenty feet square and ten feet in height at a temperature of 80°

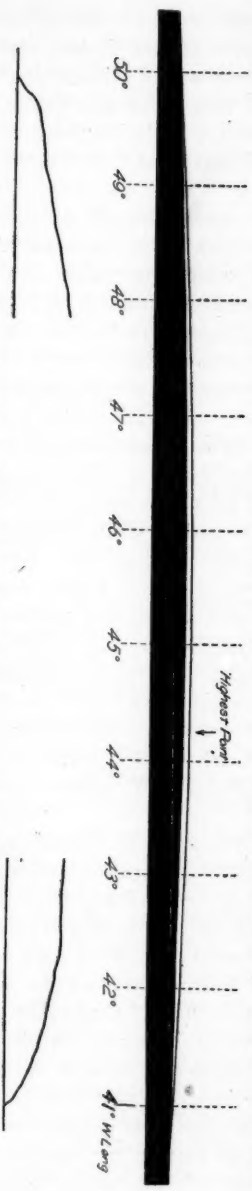

FIG. 1—Profile in natural scale of the Greenland continental glacier where crossed by Nansen in 1888 (after Hess). The marginal slopes at either side are represented below on a larger scale.

Fahrenheit, can absorb 6¼ pounds of water in the form of vapor and is then said to be saturated. If now the temperature is reduced to 60°, the same volume of air can hold but 3¼ pounds of vapor, and three pounds, or nearly one-half, will be deposited as water. Cooling of the air has, therefore, the effect of precipitating moisture, and it is because air cools as it rises that rain or snow is precipitated upon mountain slopes.

The cooling of the air as it rises upon the slopes of a mountain range is largely the result of expansion as the air adjusts itself to the lower pressures of the higher air layers. This so-called *adiabatic* change of air temperature without heat being either communicated to or abstracted from it, may be illustrated by the air current which escapes from the opened valve of a bicycle tire that has been standing in the sun on a hot summer day. Although the tube and its contained air are so warm as to feel uncomfortable in the hand, the current of escaping air is none the less so refrigerated by its expansion as to feel distinctly cool. To repeat, then, mountain glaciers are all in common nourished by snow whose precipitation is brought about by adiabatic cooling of surface winds.

Glaciers are extremely sensitive to climate changes, and are extended by any lowering of the average annual temperature of the air, as they are reduced in size by any elevation of the seasonal temperatures. It has been estimated that a fall of but 3° Fahr. in the average annual temperature

within the Scottish Highlands, would cause small glaciers to develop there, and a very moderate fall only of the annual air temperatures within the lake region of North America would with little doubt bring about a re-invasion by an ice sheet such as has more than once covered it in the past. The nourishment of this ice sheet would, however, as we now know, be quite different from that of mountain glaciers.

Before we can discuss intelligently the conditions of nourishment and waste of continental glaciers, we must learn something of their form and the meteorological conditions which surround them. Fortunately, the studies of Baron Nordenskiöld, of Nansen, Chamberlin, von Drygalski and Peary upon the "Great Ice" of Greenland, and Otto Nordenskiöld, von Drygalski, David, Scott and Shackleton in Antarctica, have now supplied the necessary data for such a discussion.

As soon as we consider the physiographic development of a continental glacier, we note at the very outset that this is fundamentally different from that of any mountain glacier. Whereas in the latter the land surface always projects above the highest levels of the ice and snow, this is never true of a continental glacier. For this reason the mountain glacier is constrained to assume a form dependent upon the slope of the underlying rock within the hollows and troughs which it occupies upon the mountain surface. The continental glacier, on the other hand, blankets the entire rock surface except where the ice thins about its margins. Its model is, therefore, independent of its basement, and experience has shown that the form which it assumes is that of a flat dome or shield, as was first proven by Nansen in 1888 by his crossing of Southern Greenland (Fig. 1).

The continental glaciers of both Greenland and Antarctica are so vast and attain such elevations that mighty mountains may exist buried deep beneath the blanketing ice, and the crucial condition for the development of the domed surface is that all hollows and troughs of the basement shall be more than filled with snow-ice mass. If the scale be so reduced that we have to do with a small but high plateau surface on which the indentations are but slight, the same shield-like form is developed, as may be observed in the ice caps of Iceland and Southwestern Norway (Fig. 2). Whenever it is held within hollows of the underlying rock surface, the glacier has movements dependent upon that surface and is modelled upon it. Beneath a continental glacier, the rock surface may be either in the form of a dome or a basin, or, so far as we

know, may have a much more complex physiography. We know, at least, that the glacier of Northern Europe in late Pleistocene times rested upon the Baltic depression, behind the great rampart of the Norwegian plateau. The movements of continental glaciers are thus, unlike those of mountain glaciers, not determined by the grades of the underlying floor, and we must seek their cause in a different quarter.

The clue to the discovery of the manner of shaping of continental glaciers was furnished by Lieutenant, now Admiral, Peary, when in 1892 and again in 1893-5 he carried out his remarkable sledge journeys across Northwestern Greenland. Here, as he has expressed it, there was found "an imperial highway" across the desert of snow. Whenever his course lay relatively near to the margin of the ice, he was forced to descend into dimples of the surface which lay back from the outlets of the ice to the fjords indenting the margins. From these "basins of exudation" he would

FIG. 2—Shield-like profile of an ice-cap in Iceland.

ascend the low ridge which lay between each dimple and its neighbors. Farther back from the ice margins these pronounced surface features faded gradually into a featureless plain of snow rising on imperceptible grades toward the interior of the continent.

Upon this desert of snow and sky Peary made a discovery of the greatest importance to students of glaciology. Whereas away from the continental ice, wind directions are determined directly by air pressures registered on the barometer, it was found that above the "Great Ice" the barometer readings were no longer of importance, for the wind direction was in all cases directly down the slope of the snow-ice surface. Upon the crests of the ridges which separated the dimples, calms were encountered, whereas within the basins the wind rushed down to the fjords from the ice plateau above. The directions of these currents were the same as those which would be set up within a film of water sliding off in all directions from the central area of the dome. Usually of sufficient strength to lift the dry granules of snow a couple of feet or more into the air, Peary advanced in a sibilant drifting snow cloud in which the dogs would be submerged perhaps for days.

When the wind developed greater strength, the drifting snow would rise to the height of a man, and during the characteristic blizzards it is probably carried to heights of 100 feet or more above the ice surface. Yet the direction of movement is always and invariably outward from the center of the dome.

The void which would otherwise develop above the center of the snow-ice shield, must be supplied from the upper air currents, which in consequence are drawn down in a central column—the eye of a so-called anticyclone fixed at this locality. Into this vortex come the high level clouds from lower latitudes—the antitrades—and from this continental ice mass are distributed the surface winds in a centrifugal arrangement. It must be evident, then, that surface air currents such as those whose moisture feeds the mountain glaciers, must be powerless to nourish continental ice masses.

The centrifugal air currents above the ice surface are explained by a refrigeration of the air layer which is in direct contact with the snow-ice surface. As all are aware, effective abstraction of heat from a gas, must be carried out at the top in order that the parts rendered heavier by cooling may descend and through diffusion affect the temperature of the remaining portions of the medium.

The movements of the cooled lower layers of air in contact with the ice are a direct consequence of the dome-like form of the mass, since this permits the heavier refrigerated bottom air to respond to the pull of gravity as do all bodies lying upon an inclined plane. Like them, also, the velocity is accelerated with time, so that blizzards which surpass in intensity any that are elsewhere known, develop periodically above our existing continental glaciers.

We have learned that when air is forced to ascend, it is cooled adiabatically; that is, without any abstraction of heat from it. Descending air currents, for a like reason, are correspondingly warmed as a result of their compression. Reverting to our example of the bicycle tire, every modern schoolboy is aware that the air which with the aid of a pump he forces into the tire becomes so warmed as to communicate its heat to the rubber of the tire. The air which slides down the slopes of the Greenland continental glacier is not infrequently so elevated in temperature as to make the hot and dry winds known as föhns a characteristic of the fjords on the margin of the continent.

But we have still to explain the derivation of such vast quantities of snow as must have been required to produce the continental

glaciers, where surface currents are effective only in transferring the snow from the central portions toward the periphery. This process must reduce the thickness of the glacier at the same time that it extends its margin (Fig. 3).

It is, moreover, at the margin of the continental glacier that the processes of waste become effective. Snow is here borne by the winds out upon the sea to be melted, icebergs are here detached and ultimately dissolved, and surface melting during the summer seasons may reduce the level of the ice surface. The most obvious effect of the anticyclone above the glacier is, therefore, to waste, rather than to nourish it. It is not here in point to affirm that existing continental glaciers are to-day in process of gradual extinction, since they appear to be drawing in their margins; for it is

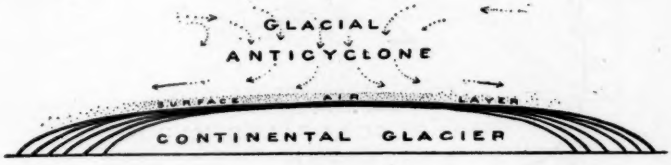

FIG. 3—Diagram to show the position of the glacial anticyclone above a continental glacier, and the manner in which the latter is shaped by its action.

none the less clear that they must in an earlier stage have acquired their vast proportions beneath the same fixed anticyclone of the atmosphere.

Is there, then, within the upper atmosphere a content of moisture which can by any process be deposited upon the glacier as snow in presence of the anticyclone? The carriers of moisture in the atmosphere are, as we well know, the clouds, and these in different levels assume quite different aspects. The highest, and the only ones characteristic of the sky above the continental glaciers of Greenland and Antarctica, are what are known as cirrus clouds or simply the cirri. The cirri usually float at elevations of between five and seven miles, and unlike the fleecy wool-pack clouds of lower levels, the cumuli, the cirri are detached, delicate, fibrous, and often feathery. In view of their great height, their moisture must be in the form of ice, both because of the existing temperature at that altitude (—65° F.), and because of the great adiabatic refrigeration to which vapor must have been subjected during its ascent from the ocean's surface.

We are not, however, dependent upon assumptions of this kind,

for cirri have more than once been penetrated by men in balloons. In the year 1850 Barral and Bixio ascending from Paris* encountered at an elevation of between four and five miles a cloud which consisted of fine ice particles. "We are enveloped," they say in their journal, "in little particles of ice in extremely fine needles which accumulate in the folds of our garments."

Effective scientific attack upon the problems of the upper atmosphere, is, however, all comprised within the last quarter of a cen-

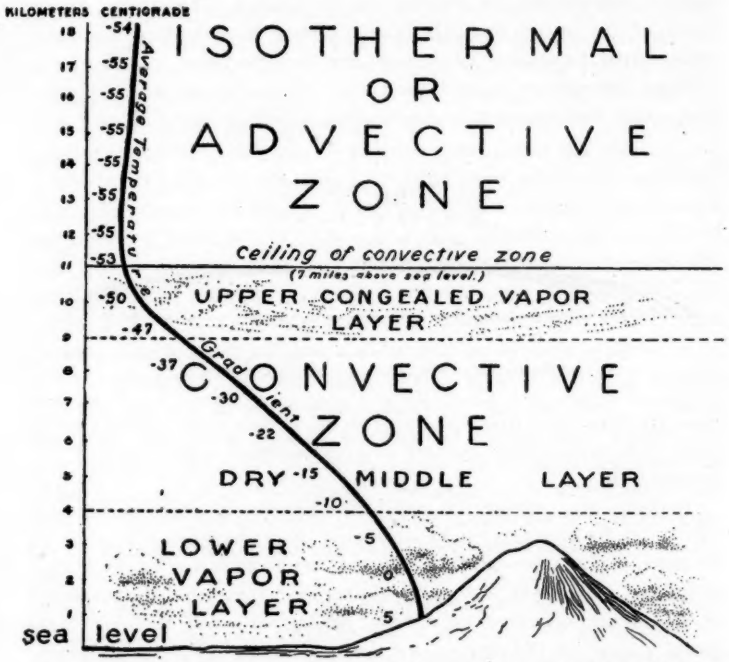

FIG. 4—Diagram to show the different layers of the lower atmosphere as determined by international observations with the use of both manned and sounding balloons.

tury, and has been coincident with so many other forward strides in science, that the results have received less attention than their importance demands. Manned balloons fitted with perfected meteorological instruments have repeatedly ascended to very high altitudes; Berson in the "Phœnix" to over six miles above the surface. On Dec. 4, 1894, when this ascent was made from Berlin,

* Barral et Bixio, Journal du voyage aéronautique fait le 27 juillet, 1850, *Comptes Rendus* de l'Acad. Franc., vol. 31, 1850, p. 129.

at an elevation of nearly six miles, this daring balloonist penetrated a cirrus cloud which in the upper layers consisted of ice needles and in the lower of very fine ice crystals, and these latter appeared to be evaporating into the dryer air below.*

By means of sounding balloons which carry self-registering meteorological instruments, direct observations upon the atmosphere have now been carried to elevations of about 60,000 feet, or nearly 12 miles.†

As a result of extended studies undertaken with international coöperation, we now know that it is a relatively thin layer of the earth's atmosphere which is directly modified by the convective air currents arising at the surface (Fig. 4). This lower and so-called convective zone of the atmosphere at an altitude of nearly seven

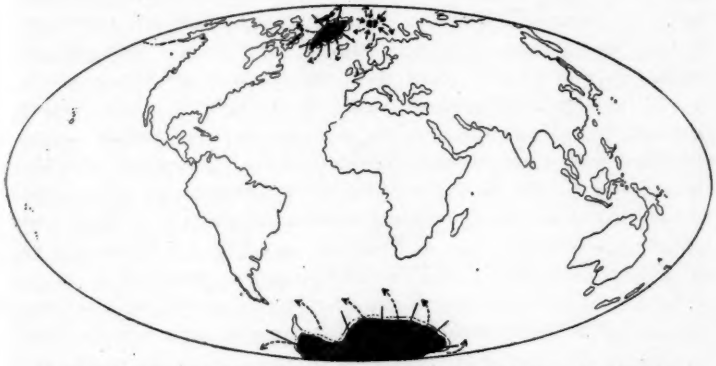

FIG. 5—Map to show the positions of the existing continental glaciers, which develop the excentric wind poles above the earth's surface.

miles ends abruptly beneath the so-called advective or isothermal zone which is warmed solely by absorption from the sun's rays which penetrate it.

As we ascend in the convective zone from the earth's surface, we first pass through a more or less saturated layer in which float the lower clouds. This surface zone of saturation extends to an altitude of about two miles and is succeeded by a notably dryer layer devoid of clouds. The air temperatures, which have been

* R. Assmann, A. Berson, and H. Gross, Wissenschaftliche Luftfahrten ausgeführt vom deutschen Verein zur Förderung der Luftschiffahrt in Berlin, 1899-1900, vol. 2, p. 434, and vol. 3, p. 181.

† E. Gold and W. A. Harwood, The present state of our knowledge of the upper atmosphere as obtained by the use of kites, balloons, and pilot balloons (Report of Committee read at the Winnipeg meeting of the British Association for the Advancement of Science in 1909), Rept. Brit. Ass., 1909, pp. 1-55.

falling rapidly as we ascend from the surface, are from here lowered by a nearly uniform and even more rapid rate approaching the adiabatic gradient for dry air. Nearing the top of the convective zone, where the temperature descends to some 67° below the zero of our Fahrenheit scale, moisture is again encountered, but here only in the congealed condition made visible at the earth's surface as the cirri. These cirrus clouds move with quite extraordinary velocity beneath the isothermal zone of the atmosphere, and in this may be compared to the water vapor, which rising in a room floats laterally just below the ceiling. Above this convective ceiling of the atmosphere, the air is dry, of almost uniform temperature, and with winds of much lower velocities than in the layer below.

As already stated, the cirri are the characteristic and almost the only clouds which have been observed above the Greenland and Antarctic continental glaciers. At times these clouds are distributed in long bands known as "polar bands" or "Noah's Ark" clouds, which, starting from a point upon the horizon, after passing the zenith converge at an opposite point. In the light of present known facts the high-level antitrades of moderate or low latitudes travel poleward with their moisture in the form of ice needles, and this is returned to the earth's surface in the vortices of great anticyclones fixed above the existing continental glaciers. These high latitude glaciers are thus, so to speak, excentric wind poles of the earth quite analogous to the excentric magnetic poles (Fig. 5).

In order to comprehend the manner of this return, we must first familiarize ourselves with the existing atmospheric condition above and about the great continent of Antarctica. If in the more open summer season we sail into high southern latitudes, we there encounter drifting sea ice, which is slowly moving northward into lower latitudes. An all but impenetrable wall, this pack ice hems in the Antarctic, and has in large measure been responsible for the tardiness of our attack upon the fascinating problems of that inhospitable region. Wherever low islands are encountered upon our course, they are found buried beneath a dome of snow and ice, while higher islands reveal projecting shoulders only of rock each bordered by a fringe of glacier, the well-known ice-foot of the southern seas.

Approaching the margins of the continent, it is not generally land that is seen, but a perpendicular wall of compacted snow which looms up in the distance, and can be followed by the eye into the distant horizon. Arriving at this escarpment, further navigation is stopped, and the problem is now to discover a favorable locality for scaling

the cliff. This so-called barrier or shelf-ice constitutes an inner and vastly thicker floating fringe of ice, which may be regarded as the second line of defense which in Antarctica has been raised against invasion by explorers. Though the problems of this shelf-ice are of great interest, they are not within the scope of the present paper.

Passing, then, this second ice terrace, which upon the Ross Sea has a width of more than three hundred miles, we at last arrive at the true continental glacier resting upon the land and resembling that which we have come to know in Greenland.

At one place only, so far as yet known, does this inland ice come down directly to the sea without an intervening rim of shelf-ice. This locality is in Kaiser Wilhelm II Land, near where the German Antarctic Expedition wintered. Here the flat dome of blue ice may be seen rising and fading away into the dim distance. The sweeping contours of the ice shield are even better revealed in views from the lone volcanic peak, the Gaussberg, somewhat within the glacier margin and the one sombre patch in the surrounding ice-scape.

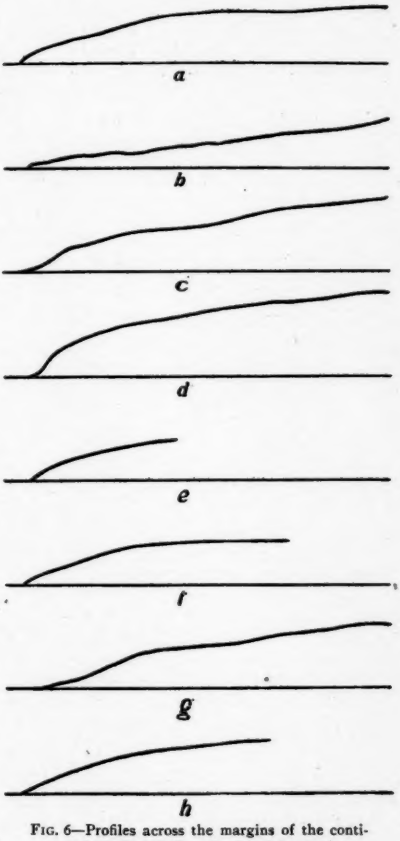

FIG. 6—Profiles across the margins of the continental glaciers of Greenland and Antarctica.

Wherever held in by a wall of mountains, as in Victoria Land, the ice margin has, in the only places where its sections may be observed—the infrequent portals in the mountain rampart—a slope which is steep and rugged in the extreme. Shackleton's plucky ascent up the Beardmore portal after first crossing the 300 odd miles

of barrier surface, is too fresh in mind to need repetition. After passing the mountains the slopes became more gradual, until at last his party advanced upon a surface so flat that to the eye it appeared horizontal, though constantly ascending toward the interior in a southwesterly direction. Scott and David have supplied us with sections across the ice margin in other parts of Victoria Land, and in these, as well as those already described from Greenland, we encounter but a single type of curve (Fig. 6). We are thus justified in saying that the flat dome of the Greenland continental glacier is duplicated in Antarctica.

But what has been learned of the air circulation above the continental glacier of Antarctica? As long ago as 1840, when Sir James Ross first sailed southward down the sea which bears his name to the front of the Great Ross Barrier, he recorded constantly increasing air pressures as though he were advancing toward a fixed anticyclone. More than a half century later, when the new era of Antarctic exploration had been initiated by the "Belgica" expedition, even though no one had yet set foot upon the continent, Bernacchi observed the prevailing southeasterly winds about its margin and was able to write of them:

> "Their frequency and force, the persistency with which they blow from the same direction, the invariable high rise in the temperature, their dryness, the motion of the upper clouds from the NW., and, finally, the gradual rise in the mean height of the barometer to the south of about latitude 73° S., seem to indicate that the Antarctic lands are covered by what may be regarded practically as a great permanent anticyclone, with a higher pressure than prevails over the open ocean to the northward."

The Shackleton expedition has now removed any doubt which could before have existed upon the subject. Travelling southward upon the ice plateau, Shackleton found that the winds were always in his face, and that the snow dunes, the so-called sastrugi, indicated that this was the constant wind direction. The data from the journey of David to the south magnetic pole, though more complex because nearer the ice margin, are yet in some respects even more complete and convincing, while Scott's earlier expedition westward from McMurdo Sound may be drawn upon for still further confirmation. In the sky above the ice dome, high level cirrus clouds were often seen floating away towards the high interior, or in a direction almost exactly opposed to that of the surface air currents.

Just as in Greenland, so here, the dry granular snow upon the glacier surface is being constantly lifted by the wind and carried outward to the margins. The gigantic centrifugal broom moves

rhythmically above Antarctica, the fierce blizzards corresponding to its outward strokes. At other times light sweepings of snow are borne outward along the surface, and Shackleton's decision to employ ponies rather than dogs in his expedition, was to insure that at ordinary times his draught animals might keep their heads above the drifting snow. Attaining the plateau, Shackleton travelled southward over a deposit of loose snow which the terrific blizzard encountered near his farthest south swept entirely away and left for his return a hard and white snow surface resembling Carrara marble. Returning by the Beardmore outlet, the upper one hundred miles he found likewise cleared of snow, while the lower forty miles lay buried deep beneath the sweepings.

The observations made at the British winter station at the margin of the Ross Barrier, have in addition supplied us with a degree of detail concerning the action of this Antarctic refrigerating engine which rythmically develops and in turn terminates the southern blizzard. The completeness of our evidence is in large measure explained by the presence of the active volcano of Erebus, the movements of whose steam cap give some hint of the direction of the higher air currents for comparison with the lower. The conditions at this station during an Antarctic blizzard were found to follow one another in regular and orderly sequence. The series begins with a gentle northerly wind, which continues for a day or two and is believed to represent air drawn inward by the contraction of the air layer in contact with the ice during a calm above the plateau. To this faint breeze there now succeeds an absolute calm which continues for two or three days. A week or more from the beginning of the calm, the air begins to move outward from the continent, due to its sliding motion down the plateau slopes, and soon develops the force of a blizzard. Simultaneously with this movement, the steam cloud above the crater of the volcano, which normally indicates an upper current from the northwest, swings around to the north and takes on an accelerated movement, as though the upper air were suddenly drawn toward the center of the plateau to fill the void there forming.

Although the winter station was located in a valley and generally controlled by local winds from the southeast, as soon as the blizzard had developed full force, this local tendency was overmastered and the wind came from the southwest off the plateau, but local conditions were resumed with the waning of the tempest. With the air always clear and dry, the blizzard comes to an end in a sudden warming of the air, the inevitable effect of its descent from the

plateau. A rise of temperature of as much as 45° Fahr. has been observed to occur within twenty-four hours, and simultaneous with this elevation of the temperature a fresh snow is precipitated which is in contrast with that picked up and driven by the wind in the previous stages.

With so many of the data at hand, we may now discuss with some confidence the mechanics of the process—the operation of the refrigerating air engine of the Antarctic. The air descending in the vortex of the anticyclone to replace that which has slipped outward and downward upon the ice dome, is heated by its fall so that the ice needles of the cirri are first melted and then vaporized. Both these changes abstract heat from the air column and thus retard the temperature elevation due to descent. When, however, the air has been heated sufficiently, the movement within the vortex is reversed, so that a current begins to ascend in the chimney of the anticyclone. As a consequence, the upper currents now move outward instead of inward, and no doubt for this reason the steam cloud over Erebus is likewise temporarily reversed in direction, indicating a current from the south. It is in this manner, then, that the blizzard brings about its own extinction.

The snow which is precipitated at the close of the blizzard is apparently the result of the moisture derived from the melting and vaporization of the ice needles of the cirri reaching the plateau and being suddenly chilled either by contact with the ice or by admixture with surface layers of cooler air. It is characteristic of such fresh snows over continental glaciers that the sky is not clouded and that the sun may be seen through the midst of fine snow needles. Baron Nordenskiöld has described a quite remarkable fall above the inland ice of North East Land, where partially melted ice grains enveloped in a globule of water were precipitated together with soft snow in an air temperature a number of degrees below the freezing point.

The transfer of such vast quantities of rounded snow grains from the interior to the margins of continental glaciers, furnishes another striking parallel to the deserts of lower latitudes. Here it is the sand which is lifted by the wind and borne to the margins. A comparison of the marginal profiles of our continental glaciers with those taken on the lee of great sand dunes is, therefore, not without interest, and for the Antarctic at least we are able to say that the shaping of the glacial margins is in large measure accomplished by the surface winds of the anticyclone.

The snow which falls at the end of the blizzard—while the engine

is slowing down or reaching the end of its stroke—may be, as we have seen, picked up in the early stages of the next succeeding blizzard and transferred to the margins. At other and more favorable times, it would appear that it is retained upon the surface, for sections carried a short distance below the surface show an alternation of snow deposits which may well represent the growths of successive seasons, and it is necessary to assume that the glacier acquired its vast proportions beneath the same fixed anticyclone which we study to-day.

The above in merest outline appears to be the process by which the continental glaciers are both nourished and shaped, a process which has little in common with that which feeds the infinitely smaller mountain glaciers. It is the lowest saturated layer of the convective zone of the atmosphere whose moisture feeds the mountain glacier. It is by contrast the uppermost layer of the same zone whose congealed moisture is drawn down to supply the nourishment of continental glaciers. Inadequate as is this outline, it is all that can be introduced in this paper, and those who find it unsatisfactory may be referred to a fuller treatment in technical papers* and in a book upon the "Characteristics of Existing Glaciers."†

FIG. 7—Line setting forth the approximate proportions of expanse to thickness between the center and the margin of the latest continental glacier above the continent of North America.

Living, as so many of us do, within the glaciated region of North America, we are naturally interested in the application of these observations to the great glaciers of Pleistocene times. Heretofore pictured in imagination as enlarged models of Alpine glaciers, these vast mantles of ice were conceived to have spread over the country by a kind of viscous flow similar to that of the proverbial molasses in January. There are, however, some noteworthy differences, as we can now appreciate. The maximum thickness of the latest Pleistocene glacier was assumed to have been 10,000 feet near the summit of its dome in Central Labrador, though it may perhaps have been twice that thickness. From this point the ice travelled southward up the northern slope of the Laurentian divide in Canada and thence to the Ohio River, a distance of over 1,300 miles. If such a mantle of ice be represented in its natural propor-

* Characteristics of the inland-ice of the Arctic region, *Proc.* Am. Phil. Soc., vol. 49, 1910, pp. 96–110; The ice masses on and about the Antarctic continent, *Zeit. f. Gletscherk*, vol. 5, 1910, pp. 107-120.

† The Macmillan Co., New York, May, 1911.

tions from the center to the margin, we may use a line six inches in length and 1/100 of an inch in thickness to represent a thickness of 10,000 feet (Fig. 7). Obviously, the force of gravity acting within the ice would be incompetent to effect a transfer from the center to the periphery, yet until the fixed glacial anticyclone had been proven and its efficiency as a broom recognized, no other hypothesis than that of viscous flow had been offered in explanation. For the Pleistocene period the fixed anticyclones were vastly larger than those of the present, and the wind circulation of the globe must have been a notably different one (Fig. 8).

But, it is urged, we have in the polished and striated rock pavement beneath the drift, the clearest evidence that the lowest layers of the Pleistocene glacier were shod with boulders, that these abraded

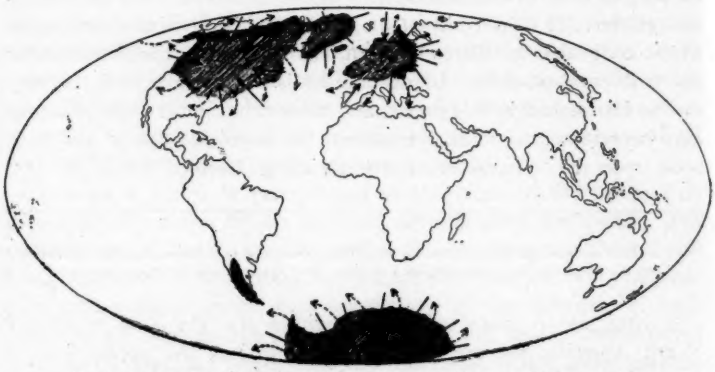

FIG. 8—Map to show the position of the continental glaciers of Pleistocene time, and the wind poles of the earth for the same period.

the underlying rock surface, and that there was a radial movement from the Labrador and Keewatin centers of dispersion. These facts cannot be gainsaid, but what we sometimes forget is that each expansion of the ice was followed by a retreat from the invested region, and, further, that the steep gradients of the surface upon continental glaciers are restricted to the outer fifty or one hundred miles. Within this marginal zone, and here only, are surface slopes sufficiently steep to give rise to true viscous flow or whatever may be the manner of adjustment within the ice under the influence of gravitation. The abraded rock pavements may all be explained by grinding and plucking action under this outer zone, which during successive advances and retreats occupies in turn all portions of the area.

The direct observation of ice movement in existing glaciers is of necessity restricted to surface and near surface layers and is of two distinct types. On the one hand there are inferences made from surface contours, from crevasses, etc., and on the other there are direct measurements carried out during more or less protracted periods. Both in Greenland and in Antarctica we find the evidence of marked differences of velocity in the surface ice currents. Walled in by mountain ramparts, each great glacier indicates clearly an abnormally high velocity within and near the outlets. Above each portal of the enclosing mountain range, the ice surface is depressed in a distinct dimple, just as is a lake surface above a raceway. Such dimples of the glacier surface have been described as "basins of exudation" by Admiral Peary. Fissures or crevasses within the ice surface, the universally recognized marks of ice movement, are always most numerous and important near the glacial margin, but they fade out and disappear at only moderate distances within the border.

Upon the glacier outlets of Greenland rates of flow as high as fifty or even one hundred feet per day have been measured. Upon the Upernavik outlet von Drygalski measured a rate of flow of 59 feet per day, while upon the inland ice some distance back, but still comparatively near to the margin, the rate was less than one inch per day.

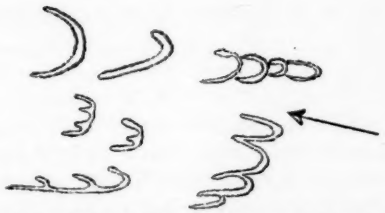

FIG. 9—Map to show the orientation and distribution of sand dunes formed by winds of Pleistocene time. The prevailing winds instead of coming from the west, as at present, were from an easterly quarter (after Solger).

The one existing ice margin which must most resemble that of the Pleistocene glacier of North America was studied by the late German expedition to Antarctica. In the newly discovered Kaiser Wilhelm Land the ice spreads, it would appear, upon relatively flat slopes without constraint from a mountain rampart, and in consequence its slopes are apparently much flatter than those observed in other localities. Here the ice is reported to rise at its margin in a cliff from 130 to 165 feet in height, then on a steeply curving slope to an elevation of perhaps 1,000 feet, at which altitude the gradients have become relatively flat and with ever increasing flatness they extend into the far interior. Near the margin numerous fissures betray motion in the ice which exact measurements indicate to be only about one foot per day. At a distance of a mile and a

quarter back from the edge even this slight movement has diminished by fully one-eighth of its value.

Overturned icebergs which have been derived from this margin make it clear that the ice is here shod with boulders and is apparently performing the same kind of abrasional work that we find such ample evidence for within the glaciated region of North America. We must, therefore, it is believed, so modify our views of Pleistocene glaciation as to account for the shaping of the glacier by the action of the anticyclone, and for the abrasional work upon its floor by internal movements which are restricted to a relatively narrow marginal zone.

We are not to-day compelled to base all our knowledge of the Pleistocene continental glaciers upon analogies from existing ones. Direct evidence of a Pleistocene anticyclone has been obtained by Professor Solger of Berlin, who in studying the fossil sand dunes of the North German plain has shown that the prevailing winds at the time they were formed came not from the west, as they do to-day, but on the contrary, from the easterly quarter (Fig. 9).*

The contributions made to our knowledge of glaciers during the last quarter century, but especially during the last decade, have been truly remarkable, but instead of exhausting this field of research, they have merely blazed the lines along which inquiry must proceed. From actual observations we as yet know nothing concerning the higher air layers above a continental glacier. What a virgin field awaits that student of the free atmosphere who is prepared to experiment with kites and with both manned and sounding balloons above either of the existing continental glaciers! Though he will certainly encounter difficulties, these would appear to be by no means insurmountable. The exploits of Peary, Scott and Shackleton have so far stimulated polar expeditions that no less than six will this year winter in the Antarctic. The Norwegian, English and Australian parties under Amundsen, Scott and Mawson are already upon the ice, and Dr. Bruce, Lieut. Filchner and Lieut. Shirase will each direct expeditions under Scottish, German and Japanese auspices respectively. Though in most of these undertakings the lure of the pole is uppermost, yet scientific and geographic studies are not to be neglected. As regards the opposite pole of the planet, Donald

* F. Solger, Ueber fossile Dünenformen im norddeutschen Flachlande, *Verh.* des XV deutsch. Geographentages zu Dantzig (Riemer, Berlin), 1905, pp. 159-172, Pls. 4-5.

MacMillan, a companion of Peary on his latest expedition, is next year to head a scientific expedition upon the Greenland ice. Students of glaciology will watch with lively interest the developments in connection with all these expeditions, and let us hope that as a result our knowledge of continental ice masses will be greatly extended.

ANN ARBOR, Mich., May 9, 1911.

PROGRESSIVE DEVELOPMENT OF RESOURCES IN THE LAKE SUPERIOR REGION*

BY

LAWRENCE MARTIN
Assistant Professor of Geology, University of Wisconsin

KEWEENAW PENINSULA CANALS AND THE COPPER MINES. The Portage Lake ship canals (Fig. 1), built where the great transverse valley nearly bisects Keweenaw Peninsula also show a large traffic and a steady increase with the development of the mineral resources of the region, especially the copper.

YEAR.	BOUND UP. NET TONS.	BOUND DOWN. NET TONS.	TOTAL FREIGHT. NET TONS.	VALUATION.
1895.....	560,672	363,084	923,756	$29,832,368
1900.....	1,190,527	677,245	1,867,772	57,380,129
1905.....	1,528,937	933,973	2,462,910	79,998,109
1907.....	1,728,673	767,663	2,496,336	101,919,661

The copper (presumed to be chiefly not ore but the refined product) makes up only three-tenths of one per cent. of the tonnage shipped in 1907 (85,279 tons), though its value ($39,228,340 in 1907) was over 38 per cent. of the tonnage. Other goods valued at $101,919,661 were carried through the Portage Lake canals in 1907.

DECREASE OF LUMBER SHIPMENTS. Another product which is carried over the Great Lakes, is lumber; but in lumber transportation Lakes Superior and Huron and Michigan will doubtless never be as important as they have been in the past. The lumber shipped past Sault Ste. Marie decreased 300 million feet; 156 million feet,

* Continued from p. 572 in BULLETIN No. 8, August, 1911.

board measure, from 1897 to 1907 (Fig. 8), and from 1906 to 1907. The relationship of the Glacial Period to the lumber industry in another connection will be discussed below.

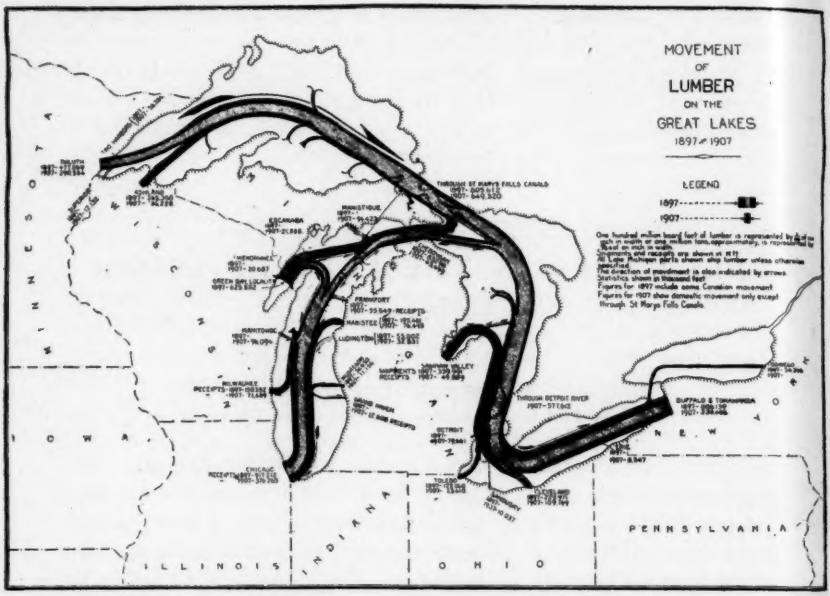

FIG. 8—Decrease in lumber shipments, 1897–1907. (After Commissioner of Corporations.)

INFLUENCE OF LOW GRADES FOR RAILROADS. The relative tonnage shipped from the several Lake Superior ports in iron ore alone, is given in the following table:

IRON ORE SHIPPED IN 1907.

LAKE PORTS.	LONG TONS.
Duluth–Superior	20,886,363
Two Harbors	8,188,906
Escanaba	5,761,988
Ashland	3,437,672
Marquette	3,013,826
Total	41,288,755 (beside 956,315 tons by rail).

This ore goes largely to Lake Erie ports (Fig. 5), including Tonawanda, Buffalo, Erie, Conneaut, Ashtabula, Fairport, Cleveland, Lorain, Huron, Sandusky and Toledo.

The mines which produce the bulk of the product carried over

the Great Lakes trade route are not on the lake shore, however, and it is accordingly necessary to connect the mines with the nearest harbors by railways. That it has been possible to do this cheaply, and to operate the railroads at moderate expense, is due to the fact that mines, without a single exception, are situated at moderate distances back from the lake shore (Fig. 1), 50 and 80 miles in the case of mines of the Menominee and Crystal Falls districts, whose port is Escanaba; 11 to 14 miles in the case of the mines of the Marquette district, whose port is Marquette; 45 miles in the case of the mines of the Penokee-Gogebic district, whose port is Ashland; 70 to 84 miles in the case of the mines of the Mesabi Range, and 80 to 90 miles in the case of the mines of the Vermilion Range, whose ports are Duluth, Superior and Two Harbors, about 100 miles in the case of the Canadian mines tributary to Fort William and Port Arthur and as yet largely undeveloped, and 12 miles in the case of the mines of the Michipicoten district, whose ore is shipped from Michipicoten Harbor, and smelted at Sault Ste. Marie, Canada. This latter is the only case where steel is produced in the Lake Superior region from the ore which is mined there, although pig iron furnaces run by charcoal have been in operation at Ashland, Marquette, Duluth and many other points in the Lake Superior region from its discovery.

The shipping of the copper ores from the mines of Keweenaw Peninsula, also, has the advantage of having the stamp mills at lake level, and bringing the ore down a gravity road to a place from which the copper can be shipped directly by boat or by railroad.

Thus the heavy iron and the copper ores are always brought down-grade and the empty cars hauls up-grade, which is very much easier than if the loaded cars had to be carried up.

Practically all of the railroads, with the exception of the spur lines which run into the mines, and, therefore, have in some cases rather steep grades for short distances, have been able to construct their lines with a smaller degree of expense than is the case with most railroads going into mineral-producing regions. The railroads of the Rocky Mountains, for example, are obliged to go to great expense to reach the mines, though in the case of railroads reaching many coal fields, the expense of construction is in general rather smaller.

The Canadian Pacific Railway and the Canadian Northern Railway (and the Grand Trunk Pacific, now being constructed), are able to transport their produce from the Canadian wheat fields to Fort William and Port Arthur, the ports on Thunder Bay, Canada, and

the Northern Pacific and Great Northern are able to carry grain from the wheat fields of Minnesota, the Dakotas, and adjacent states to the ports at the head of Lake Superior at comparatively small expense. The railroads which enter the region to carry out the lumber have had a similar history of being able to reach the forests or saw-mills without building unduly expensive lines. The rather low relief to which the country had been worn down is responsible for the fact that so great a number of railways have been able to build their net-work of tracks (Fig. 1) across this comparatively unsettled country, and to compete with one another profitably.

USES OF SWAMP LANDS. The enormous areas of swamp land, where great deposits of peat are found, are due directly to the

FIG. 9—Lake of the Woods on the International Boundary. Such lakes are a great asset in the lumbering industry.

Glacial Period. Some of these swamp lands, especially in Minnesota, have been recently mapped and studied in view of their potential possibilities as reclaimable farm lands, as sources of permanent water supply, and as producers of peat. C. A. Davis has studied the peat of the upper peninsula of Michigan.* The uses of peat as a fuel, as a fertilizer, in making paper, etc., and in generating illuminating gas are worth considering, but especially the use of peat coke in relation to the iron industry. This latter is already beyond the experimental stage in European countries, where peat coke is much in demand because it has all the advantages of charcoal.

* Geol. Survey of Mich., *Ann Rept.*, 1906, 183-286.

INFLUENCE OF GLACIATION ON LUMBERING. Reference was made in a preceding paragraph to the influence of the glaciers upon the lumbering industry. Every one conversant with the principles of lumbering can realize what it would mean to the Lake Superior region if there had been no lakes there. Just what the relationship of the amount and kinds of forests to the soil and to the rather sluggish streams produced by the glacial invasion may be, will not be discussed, although it is suggested that the sandy soil which supported such a growth of gigantic pines is a factor in this connection. The principal point to be noted, however, is the fact that if it were not for the great number of regulated streams, the driving of logs to the saw-mills in the spring would not have been possible, and without the innumerable lakes (Fig. 9) the storage of these logs for sawing during the summer would also have been curtailed.

WATER POWER DUE TO GLACIATION. It is probable that before the glacial invasion most of the present waterfalls did not exist. These falls now furnish the water power upon which many of the smaller saw-mills depend. Moreover, the greater amount of water power produced by the diversion of a stream so that it plunges down over the rock ledge which it either did not encounter or had cut away before the Glacial Period, is significant in connection with the growing use of electricity generated by water power which is becoming so prevalent. In the future this natural resource of water power in the Lake Superior region will doubtless be taken advantage of to an even greater extent. Water power on the St. Louis River (Fig. 10), which descends 456 feet in about six miles, now runs an electric plant which lights Duluth, about twenty-five miles away, and runs its street car lines. The project of running the railroad lines, which carry the ores of the Vermilion and the Mesabi Ranges to the shipping points, by electricity generated by the head of water which descends at various points from the highlands north of Duluth to Lake Superior, may even be carried out within a few years. This could be done to equal advantage in the case of several of the other iron ranges. Manufacturing, especially in view of the geographical association of a raw product, like iron, with water power might be a notable future industry of this region, though in the absence of coal it seems unlikely to become a great industry; nor will it ever pay to carry the coal to the ore rather than the ore to the coal, as is done now.

The government, in coöperation with various State bureaus like the Wisconsin and Michigan Geological Surveys, is already investigating the possibilities of water power as a resource of various

parts of this region, especially in Wisconsin,* in Minnesota† and Michigan.‡ They are also studying the relationship of surface water to mining, to agriculture, to health, etc. The use of some of the lakes as sources of water supply for cities, as an ice supply, and as sources of fish, may also be pointed out.

THE FISHING INDUSTRY. In Lake Superior itself, as well as in northern Lake Michigan and western Lake Huron, the fishing industry is of marked importance, giving employment yearly to about 4,000 people and furnishing a considerable food supply to the larger cities and towns and for shipping to regions outside. During 1903 the American portion of Lake Superior and the parts of Lake Michigan and Huron within the area of Fig. 1 yielded 29 million pounds of fish, for which the 2,219 fishermen received $871,515. The Canadian part of Lake Superior doubtless yielded half as much more.§ The local income from this resource was, therefore, about $1,250,000 in 1903.

LAKES AS RESORTS. As summer resorts, many of the minor lakes, as well as the Great Lakes themselves, are already taken advantage of, especially in northern Wisconsin and Michigan and Minnesota. They are also visited by numbers of sportsmen, who shoot ducks and other birds about these lakes, and hunt game, notably the moose and deer, in the adjacent forests.

AGRICULTURAL RESOURCES. The valley of the Red River of the North, which lies in the northwestern part of the area, occupies the bed of an extinct glacial lake (Lake Agassiz), and is one of the richest wheat lands in the world. This suggests the possibility that in the future more advantage will be taken of these regions as seats of agriculture. The Bureau of Soils of the United States Department of Agriculture, as well as the State Geological Surveys of Michigan and Wisconsin, and the Agricultural College of the University of Wisconsin and adjacent colleges have been studying

* L. S. Smith: "Water Powers of Northern Wisconsin," *Water Supply and Irrigation Paper* 156, U. S. Geol. Survey, 1906; *Bull.* XX, Wis. Geol. & Nat. Hist. Surv., 1908; Barrows and Horton, *Water Supp. and Irrig. Papers* 156, 206, 1907, 20-26; Horton and Follansbee, same, 207, 1907, 50-65.

† R. B. Dole and F. S Wesbrook: "The Quality of Surface Waters in Minnesota," *Water Supp. and Irrig. Paper*, 193, U. S. Geol. Surv., 1907; Horton and Follansbee, same, 207, 1907, 39-50.

‡ Frank Leverett: "Flowing Well Districts in the Eastern Part of the Northern Peninsula of Michigan"; A. C. Lane: "Waters of the Upper Peninsula of Michigan," *Water Supply Paper* 160, U. S. Geol. Surv., 1906, 29-53; *Ann. Rept.*, Geol. Surv. of Mich., 1903, 113-167; Barrows and Horton, same, 206, 1906, 17-20, 35; A. C. Lane: "Water Resources of the Lower Peninsula of Michigan," *Water Supply and Irrig. Paper* 30, U. S. Geol. Surv., 1899; and the various earlier bulletins of the same bureau on the progress of stream measurements for different years.

§ "Statistics of the Fisheries of the Great Lakes in 1903," by A. B. Alexander, *Appendix* to the Report of the Commiss. of Fisheries to the Secr. of Commerce and Labor for 1904, Washington, 1905, 643-731.

the soil conditions in the vicinity of the northern lakes, and have already published several maps and reports.* These investigations often lead to the production of more profitable crops than those raised in one place, or in the production of crops where nothing is now raised.

These lands are already being taken advantage of in parts of Minnesota, by European emigrants by whom the vacant lands of northern Minnesota, Wisconsin and upper Michigan are regarded as offering an inviting opportunity. Numbers of inhabitants of northern and western Europe who come to the iron ranges to work in the mines, have already begun to buy cut-over lands from the lumbermen for farms. More than that, great regions which are unfit for agriculture and from which the forests have already been stripped are a possible future timber reserve which will either reproduce the forests which have been cut or burned away, or will be reforested by the people of the United States, whose lumber resources are already within sight of exhaustion. These lands on the watersheds bear an important relationship to the flow of the streams rising there. The State of Wisconsin already has one of the largest State forest reserves near the divide of the Mississippi, Lake Superior and Lake Michigan drainage.

CITIES. As a result of the various sorts of activities in the Lake Superior region, five kinds of settlements have grown up, different in the quality as well as in the length of life promised them. The first resource of this region, the fur trade, resulted in the first type of settlements,† trading posts, such as those of various French and English companies, including the Hudson's Bay Company. These posts have many of them seen their time of prosperity and are now abandoned. Fort Charlotte, Minnesota, on the grand portage, was of this type, as was also Fond du Lac, at the head of navigation on the St. Louis River of Minnesota, which was founded very early by the Hudson's Bay Company, and on whose site a small modern village stands. Nipigon, another Hudson's Bay Company post, still maintains a small trade. On the sites of certain of these fur-trading posts, however, permanent towns have been built for other reasons.

With, and after these, came the second type of settlements, the missions, some of them later becoming forts, like Michilimackinac, L'Arbre Croche, Fort La Baye at Green Bay, the fort at Sault Ste. Marie, etc.

* "Soil Surv. of the Munising Area," Mich., 1905; "Carlton Area," Minn.-Wis., 1906; "Superior Area," Wis., 1905; "Portage County, Wis.," 1906, etc., U. S. Dept. of Agric., Bureau of Soils.

† Even preceding the Jesuit missions. See F. J. Turner, "Character and Influence of the Indian Trade in Wisconsin," Johns Hopkins University Studies, Vol. 9, p. 569.

In connection with the lumber industry, towns of the third type were built at many points, as, for example, at Grand Rapids, Minn., and throughout upper Michigan and Wisconsin and Ontario. Not a few of these towns have also been abandoned, as the reason for which they existed has disappeared with the cutting off of the timber (Fig. 8); but on the sites of some of these towns, also, permanent settlements have been built. The paper mills near Grand Rapids, Minnesota, and the furniture factories at many Wisconsin and Michigan towns came there because of water power and

FIG. 10—St. Louis River, looking North, near Thompson. Rapids now used to generate electricity for long distance transmission.

available lumber and wood pulp. In the lowland, eastern portion of the upper peninsula of Michigan, which Rominger described as an unbroken forest* in 1873, there is almost no forest left, and settlements are sparse. During the cutting of the lumber, a considerable temporary population peopled the region, into which an agricultural population is now slowly going, with the establishment of agricultural centers of population that are replacing the lumber towns.

As a result of the mining industry, the fourth class of towns

* Carl Rominger, Geol. Survey of Mich., I, 1873, Part III, page 8.

were built up. The iron mining towns (Fig. 1) include Tower and Ely in the Vermilion district; Virginia and Hibbing on the Mesabi Range; Brainerd in the Cuyuna district; Hurley, Ironwood and Bessemer in the Penokee-Gogebic district; Ishpeming and Negaunee in the Marquette district; Crystal Falls, Iron River, Florence and Iron Mountain in the Crystal Falls, Iron River and Menominee districts. Copper mining towns are Houghton, Hancock and Calumet on Keweenaw Peninsula. Some of these towns, now flourishing, are destined to disappear, as the ore which determined their location becomes exhausted. As an example of a settlement which was first a fur-trading post and then a lumber town, and still later a mining town, Tower, Minn., may be cited. With the extinction of the fur-bearing animals in large numbers and the diminution of the lumber and the iron ore, Tower has had a decline in recent years, and would probably eventually be abandoned were it not the logical site for a summer resort, and a starting point for camping and hunting expeditions. Its beautiful location on Vermilion Lake, at the beginning of a long canoe route over lakes and streams, probably will insure there always being a town at Tower.

Numerous smaller places which have been centers of population because of the fur, lumber or ore, might be cited. The fur-trading posts, missions and forts are many of them gone, though large cities with other reasons for existence stand on the sites of a few; the lumber towns, as such, are fast going out of existence; and the beginning of the abandonment of some of the mining towns is in sight.

The fifth class of towns in this region are those which owe their location to their being commercial centers, *i. e.* shipping points for ore (Fig. 3), gathering or distributing points for agricultural communities (Fig. 4), manufacturing towns with location determined by raw materials and water power (Figs. 7 and 8), or else places of transfer of goods from railway trains to sailing vessels or steamers, especially iron on its way to coal fields or to markets (Figs. 3, 4, 7 and 8). In this class is a great number of large and prosperous towns, the largest and best in the whole region (Fig. 1). Among these, Duluth, Minn., is easily the leading city, and with its twin city, Superior, Wis., has a population of nearly 119,000, the latter city having a notable ship-building industry and many flour mills. Ashland, with a population of about 14,000; Marquette, with a population of 11,500; Fort William and Port Arthur, together with a population of 7,000; Houghton and Han-

cock, with a joint population of 14,000; Escanaba, with a population of 13,000; Sault Ste. Marie, Mich., and Sault Ste. Marie, Ont., with a joint population of nearly 20,000, are all cities which have other reasons for their existence than the exploitation of the expendible resources like fur, lumber and ore, and which, therefore, promise to continue to be centers of population and to increase in size and in prosperity even after all of the iron and copper ores of the lower grades have been shipped.

Away from Lakes Superior and Michigan are the twin cities of St. Paul and Minneapolis, which together have a population of 516,000, and the smaller cities in Minnesota, Wisconsin and Michigan (Fig. 1), like Winona, Eau Claire, Chippewa Falls, Grand Rapids, Stevens Point, Wausau, Menominee, Marinette, Green Bay, Oshkosh, and many others which at the present time have reasons for existence which are related to other things beside the development of the mineral, forests and agricultural resources of the Lake Superior region, and whose relationships will not, therefore, be discussed in this paper.

THE FUTURE OF THE REGION. It is enough to say that the region under consideration, with a sparse population, of which a large percentage is now concentrated in a comparatively small number of cities and towns in proportion to the very great area, will in the future come to support a population many times as great and probably less centralized. This will doubtless come when the local agricultural lands begin to produce the food of the mining towns. The region east of Marquette, for example, might produce vegetables, fruits and dairy products for that mining center. The foodstuffs used at Marquette are now largely obtained from Chicago, to which they are shipped from some other agricultural district. Eastern Minnesota farms might feed Duluth, Superior, and the iron range towns, instead of having the foodstuffs of these towns largely reshipped from St. Paul and Minneapolis.

In the future, the favorably located places will continue to grow, and the unfavorably located places will decrease in size. The vacant intermediate areas, however, should come to be occupied by larger and more permanent populations of farmers, factory hands, etc., so that the proportion of people living in the cities and towns will probably not continue to be predominant, and the empty areas will gradually be filled up with a population having other pursuits besides those involved in the development of the mineral resources of the region, in which much concentration has already taken place.*

* H. R. Mussey: "Combination in the Mining Industry," Columbia Univ, Studies in Hist. Econ. and Pub. Law, XXII, No. 3. 1905, 1-167.

The natives, the fur-traders, the priests, the soldiers, the lumbermen, the fishermen and the miners have opened the region. It remains for agricultural and commercial pursuits to make use of it to its greatest capacity and continue the progressive development and utilization of its resources.

MAPS OF PRIMITIVE PEOPLES*

TRANSLATED FROM THE RUSSIAN AND ABRIDGED BY

H. DE HUTOROWICZ

This quarto volume is a work on the origin and development of the map. A map which N. L. Gondatti brought from the Tchuktchi country, northeast Asia, in the basin of the Anadyr River, suggested the idea of writing it. The author gave special attention to primitive maps when he was studying with Ratzel in Leipzig and also during his cartographic studies. After examining the Tchuktchi map in the Anthropological Museum of the Moscow University, he endeavored to find primitive maps in Berlin, Paris, Rome, Dresden, London and other cities, but found only three maps of the Marshall Islands in the Grassi Museum of Leipzig. In 1907 he found in Stockholm maps by the Greenland Eskimo and then succeeded in procuring for examination the Grösser collection in Berlin. About that time the Khatanga expedition of the Imperial Russian Geographical Society returned with a large collection of maps made by Samoyeds, Tunguses, Yakuts, Dolgans and three maps from the Kolyma R. region now at the Museum of the Imperial Academy of Sciences at St. Petersburg. He also found at this museum Rink's Eskimo map. All this material, together with maps sent by American scientific institutions, completed the collection used in preparing this work. It embraces fifty-five maps from Asia, fifteen from America, three from Africa, forty from Australia and Oceania and two from the East Indies.

Good eyesight and a highly developed gift among primitive peo-

---

**Izviestia Impieratorskavo Obshchestva Lubitielei Estiestvoznania, Antropologii i Etnografii, sostoyaszchavo pri Impieratorskom Moskovskom Universitietie. Tom CXIX. Trudy Geograficheskavo Otdielienia. Vypusk II. B. F. Adler. Karty Piervobytnykh Narodov. S.-Peterburg, 1910.*

(*Bulletin* of the Imperial Society of Students of Natural History, Anthropology and Ethnography, at the Imperial University of Moscow. Tome CXIX. Works of the Geographical Section, Number II. B. F. Adler. Maps of Primitive Peoples. St. Petersburg, 1910. viii and 350 pp.)

ples of finding their bearings have helped to evolve cartographers among them. Many travelers have observed what some of them call "telescopic" eyesight among these peoples. A Yakut distinguished with the naked eye stars in the Pleiades not usually seen without a telescope. The Yakuts say there are many stars in this group, but only seven large ones. The Buriats guide their movements by the pole star at night and the sun by day. According to Mr. Jochelson, the natives of northeast Siberia usually find their bearings by the rise and setting of the sun, and by the stars at night. Caravan guides in the Sahara and Indians in the forests of Bolivia find their way under the most difficult circumstances. As for the Eskimos, their topographical aptitude is extraordinary. They have a large knowledge of the stars; and climbing to the tops of hills or mountains, they mark localities on their maps which are hidden from view at lower levels.

But many primitive peoples do not make maps though they have a good idea of the topography of their countries. The natives of the Andaman Islands have a well-developed sense of location, but not a single specimen of map-drawing. But the desire to express on a small scale some sort of a picture of the part of earth they live in is widespread. Some tribes carve maps out of wood, as the natives of east Greenland, some of the North American Indians and many Polynesians. When a traveler asks for directions to reach this or that place many Indians of South America, Negro tribes, Siberian natives or Australians rapidly sketch a map on the sand or snow, paper or birch bark. They seem to think that this graphic delineation will be more helpful than mere verbal guidance.

The Tchuktchi collection from the district of the Anadyr includes two specimens of maps drawn with reindeer blood on wooden boards. Both maps show the delta of the Anadyr. Mr. Adler describes the drawing as carefully done. The winding course of the river, the vegetation on the shores, fords, hunting-places, etc., are easily seen. The complicated delta with its numerous islands is faithfully reproduced. Two parallel lines show the shores, but the Yakuts, Samoyeds and some other tribes draw a river with one line. Many splashes of red on the shores, no doubt indicate hills. The map picture is enlivened by hunting and fishing scenes. At one corner is a group of three huts, fishing nets are spread in the middle of the river and a herd of swimming reindeer is shown. Mr. Adler asserts that the map in its general features compares, not unfavorably, with a map of the same region made by the Russian Ministry of the Marine. This product of the Tchuktchi, unfamiliar with draw-

ing instruments and correct methods, is a fine example of the cartographic art of primitive man.

Because ethnologists have shown the close relationship between the Tchuktchi and the Eskimo, Mr. Adler leaves his discussion of the maps of other Asian tribes at this point to treat at length of the Eskimo as map makers. He describes a map in R. Andree's "Ethnographische Parallelen" made by the Eskimo Kalliherua in the winter of 1850-51. Drawing his map with a lead pencil, the first he had ever seen, he showed the coast line from Pikierlu southward to Cape York with noticeable approximation to the truth. Then he discusses examples of other Eskimo maps found in the works of Nelson, Hall, Boas, Rink and others. Boas found much to commend in the maps of the Eskimo with whom he lived in Baffin Land. In answer to his geographical questions they would often begin at once to draw a map, sometimes on the snow. Five maps in the Boas collection are of Cumberland Sound, made by different Eskimo, and their similarities indicate care and considerable skill in the delineation of these coasts. The fiord character of Frobisher Sound and the mass of small islands and little bays are well indicated. The hatchings on some of the maps doubtless indicate the high elevation of the shores. When Beechey asked for information of the Eskimo of Kotzebue Sound they drew a map for him on the sand. They sketched a shoreline with a stick and divided it into equal parts, each part representing a day's march. They showed hills with heaped up sand and stones and made an island with pebbles. Many onlookers made suggestions as the work went on.

All this was of the nature of a relief model, and the East Greenlanders, especially, make their maps in relief by carving them on boards that are drifted to their shores. They have the idea that relief maps represent nature more faithfully than other maps. Holm took home to Copenhagen three specimens of these reliefs. Of course the fundamental purpose of all these primitive maps is to show routes to hunting grounds, fisheries, settlements, etc. These East Greenlanders live on or near the coasts of fiords, and their routes are along the fiords or across them, at convenient places; so their relief maps mainly represent deep and narrow valleys and the intricate nature of the region is well shown in their deeply carved bits of wood on which they try to represent nature on a small scale.

Continuing his description of maps made by tribes of northern Asia, Mr. Adler gives special attention to the Tungus maps that were brought to Russia by the Khatanga expedition, and he is the first to reproduce specimens of them. Prince Kropotkin, P. E.

Ostrowski and others agree that the Tungus make maps with much skill, and Kropotkin says that during his travels in Transbaikalia he was greatly assisted by the information he found on a Tungus map that had been drawn on birch bark. None of the natives who drew the fifteen Tungus maps that appear in Mr. Adler's work had ever seen or heard of our cartographic products. They orient their maps not in accordance with cardinal points but with relation to the prevailing direction of the chief water artery. Like all maps of primitive or ancient peoples, a Tungus map is truest of the region best known to the map-maker, and this region is usually shown in the central part of his map, so that nearer the border, distances and surface features are likely to be less accurately shown. On the whole, however, the Khatanga expedition and Mr. Adler found a great deal to commend in the maps.

Among the other maps secured by the Khatanga expedition were three made by descendants of Russian peasants who are on the same cultural plane as the natives. Their maps are poorly drawn and in all respects are inferior to those of the aborigines. The Ostiaks, Gilaks, Ainy Karagoss and Soïots are mentioned among other Siberian peoples as having some aptitude for cartography, and specimens of maps from southern Sakhalin are given. The Turkoman peoples orient their maps exclusively by the main direction of the mountain ranges. Other peoples of North Asia, such as the Mongols and Buriats, draw maps only when requested to do so, though they have an excellent idea of direction. Several specimens of their maps show Buddhistic or Chinese influence, indicate every inhabited place, and mountains are sketched in the Chinese manner without perspective.

The maps made by the Indians of North America are strikingly similar to those made by the Yakuts, Tungus and other peoples of North Asia. Though Kroeber said that these Indians do not make maps, the author quotes Carver and several other authorities to show that the contrary is the case and that they draw route and other maps on sand, bark, leather, etc. Prof. Chamberlain has recently written that the Kootenay Indians of British Columbia have much cartographic aptitude. When he showed them a map of their country they at once pointed out the principal mountains, lakes, rivers and other features. They make good cartographic sketches. Eustace Jacobs says his Indian guides made good map sketches of regions they had traversed only once. Mr. Adler reproduces six maps (after Pickering) of the Oregon Indians. The guiding line is a river, lake or drainage system. Mountains also are sometimes

used for orientation, forests are rarely shown, but human habitations and the best hunting districts are indicated.

The Indians of South America are not far behind the tribes of the northern part of the western world in map-making. Specimens of their maps are shown in the books of Karl von den Steinen, P. Ehrenreich, M. Schmidt and Dr. Koch-Grünberg. A large collection has also been made by Dr. H. Meyer, who intends soon to publish his material. In the basin of the great Xingu tributary of the Amazon, the natives show rivers by straight lines, and lines across them mean waterfalls or swift currents. It is important to indicate them, because they are obstacles to navigation. When an old Indian was asked to tell what tribes live along a part of the Xingu River, he drew in the sand a map of the river and showed the location of the various tribes along its banks. With the aid of Indian maps, Prof. von den Steinen was able to trace the inter-dependence of the Kulisehu and Kuluene Rivers. In mapping the sources and upper tributaries of the Rio Negro, Dr. Koch-Grünberg derived some assistance from the maps of the natives. A particularly striking map, reproduced by Mr. Adler, shows the Caiary-Uaupes River at the point where it falls into the Caduiari River.

The natives of Africa are seldom mentioned in the literature of primitive map-making. Largeau says that the natives of the Sahara help out their narratives by drawing maps on the sand. One map shows the Ahoggar Range in the Central Sahara, which has only recently been well mapped by the French. On this map four parallel lines represent meridians, a fact that surprised Largeau, though Mr. Adler thinks it is not strange, as Arab traders have long disseminated geographical and cartographic ideas in the Sahara. A map drawn for Clapperton by the Sultan of Sokoto shows the Quorra or middle part of the Niger and the bordering regions. Beck brought home a map made by an Abyssinian showing the Godjeb as the upper part of the Sobat River, which is not the case.

Explorers have obtained a considerable number of maps made by Bushmen of South Africa and the Bantus of Central Africa. The chief of the Bakubas made a rather remarkable map of a part of the Sankuru River system for Dr. L. Wolf, the explorer of the Sankuru. Prof. K. Veule, one of the explorers of German East Africa, obtained several native maps. One of them shows the German colony throughout its east and west extent and Prof. Veule regards it as a remarkable product. [It certainly contains a great deal of information, though it is full of blunders. The map-maker appears to have faced the south during his work, so that the bottom of

the map is really its northern edge and his east and west directions are similarly transformed. He has laid down a number of caravan routes, names the tribes and the settlements along them and differentiates the houses of white men from the huts of the natives. He has some notion of scale and his east and west distances are not very erroneous, but the actual distances between stations and settlements is still badly distorted by the fact that some of his places are several degrees of latitude from their proper positions.—EDITOR]. Another map, reproduced by Mr. Adler, of the region lying around the southern end of Lake Tanganyika is declared by Prof. Veule to be astonishingly good, considering that it is the product of an untutored native.

Australian natives show distinct map-making aptitudes. They are good observers and thoroughly know the regions they inhabit. Dr. Jung says that in his travels around Lake Eyre and along the Darling, Warrego and Murrumbidgee Rivers he met natives among the various tribes who made for him good sketches of the route ahead. Dr. Neumayer found to be serviceable a native map, specially prepared for him, of a route he was about to follow near the lower Murray River. Ratzel wrote of the topographical talent of the Australian natives and said their "eye memory" made them geographers.

But the natives of Oceania surpass the Australian natives in map results. This is not surprising, for in their travels along the island coasts and from one island to another they must observe minute details of coasts, atolls, reefs, etc., in order to navigate intelligently and safely. The Polynesians are especially distinguished as travel-geographers. Native maps have been reported from many islands and groups, *e. g.*, New Zealand, Fiji, the Marshall, Palau and Ladrone groups, etc. The Maori have much geographical instinct. They made a map of Lake Rotokakahi for Hochstetter, and though their contours of the lake were not entirely correct, he found the map a good specimen of primitive work. The Palau Islanders make a sort of relief map of their islands. Adelung says these reliefs were helpful to the Spanish missionaries when the islands were discovered in 1696. A native map of Tahiti published by Forster is well known. Ratzel says that though this map gives names correctly, it misrepresents the size and position of islands in the Society Group. The map is cited, however, as throwing light on the spread of the Polynesians to the West.

The Marshall Islanders have always been unwilling to explain their maps, and they are hard to read, but the investigations of

Winkler and Schück seem to afford a good explanation of them. These maps consist of wooden sticks fastened together, at various angles, with shells and small stones. Winkler divides them into three groups: 1. Maps of the entire group; 2. Maps showing parts of the archipelago; 3. Charts used in navigation. The positions of the sticks give a variety of information, much of which is still obscure, but it is known that they indicate places where the combers fall most violently upon the shores. They show other movements of the sea, also distances between the islands; in fact, they are charts made by a sea-faring people to help them on their way and diminish the dangers of their voyages. These remarkable maps are well represented in European Museums.

Mr. Adler gives many pages to an examination of the so-called prehistoric maps that have been discovered. He inclines to the view of Fr. Rödinger that the two pieces of split bone covered with a network of lines, among the cave finds of Shafhausen, were meant to designate routes in some locality. A. Ernst maintains that many of the petroglyphs of Venezuela were intended to represent topographic forms; and Bastian believes that many of the petroglyphs discovered in Columbia are elementary maps. It is thought also that many Siberian petroglyphs show parts of the Yenisei River. Koch-Grünberg, P. Andree and others say they do not believe that carvings on rocks, many of them involving great labor, were made for mere pastime, and they agree with Shurz that not a few of them were "rude and awkward attempts at map-making."

Mr. Adler also compares, at length, the maps of the semi-cultured and cultured peoples of antiquity with those of the primitive peoples of to-day. In his opinion some of the maps produced in ancient Mexico and Peru were better and more serviceable than those made by Europeans in the Middle Ages. The Mexicans made maps, sea charts and cadastral plans that were better than those of the Persians. The Peruvians made relief maps of stone, clay and straw, but their work was inferior to that of the Mexicans. The cartography of the ancient civilizations of America appears to have had no influence upon the work of the modern primitive Americans. The Inca and Aztec cartography was entirely original, uninfluenced by any foreign models.

Assyro-Babylonian maps profoundly influenced the geographical knowledge and attainments of the Egyptians. Among these maps reproduced by Mr. Adler are a map of Babylon with text and a plan of the fortress of Babylon. Jewish cartography also was greatly influenced by the cartographic products of Babylon and Egypt.

Geography could not develop independently in small Palestine, but the country was on the main route between the two powerful nations to the east and west, and their geographical knowledge and ideas became those of the Jews. Carl Ritter was among those who believed that a map of Canaan was produced, though there is no direct evidence of it in Josephus. Herodotus mentioned that the old Persians made maps, though the Persians of to-day are poor cartographers and poor geographers as well. The geographical knowledge of ancient India shows both Babylonian and Chinese influence, and the Brahmins made maps of the world and of various regions. The oldest map of India, according to Ritter, was in the form of a lotus flower floating on the water. A map made by a Nepal native and described in the *Annales* of the Musée Guimet is a valuable document showing mountains, rivers and their confluence, routes, temples, towns, etc. A better map of India from a technical point of view was that presented to Warren Hastings in 1772. Some of these maps lack lines of latitude and longitude, have no scale, and mountains and rivers are shown by lines.

Historical documents show that the Chinese made town plans and drew maps as early as 3,000 B. C. None of these ancient documents have been preserved, as they were of the nature of secret papers, and many were intentionally destroyed. Two maps on stone are supposed to be the oldest in existence. They were discovered by P. G. Maurice and described by E. Chavannes. Both are reproduced in Mr. Adler's work. One of them has the title: "Map of China and of Foreign Lands," but shows only China and Korea and place names in other parts of the near-by world. The other shows places, mountains and rivers mentioned in the famous chapter of Chou-King entitled "Tribute of Yu." North is at the top of the map, in contrast with many other Chinese maps showing South at the top. Comparison of these with modern Chinese maps, in Mr. Adler's opinion, shows that the Chinese have not made much progress in cartography. [This, however, is certainly not true of recent Chinese maps, which show that Chinese cartography is becoming profoundly influenced by western methods.—EDITOR]. The Chinese had some astronomical knowledge, were good draughtsmen, and d'Anville called them the best cartographers in Asia.

Japanese maps antedated the oldest European work. The monks began to make maps soon after the introduction of Buddhism into Japan. Their acquaintance with Dutch and Portuguese traders helped them to attempt maps of the world. The maps they make to-day are as good as those of Europe.

Ancient Egypt bequeathed us an interesting type of map of which a considerable number still exist in the Turin and other museums. Mr. Adler reproduces two of them and gives a long description of the oldest yet found—a map showing the gold-bearing districts between the Nile and the Red Sea near the southern border of Upper Egypt. The Egyptians were strongly influenced by Arabian and Greek geographers and cartographers of whose maps we have no copies and all we know of them is from the writings of Herodotus, Aristotle and others. According to these references, all ancient Greek maps were round wheel maps. The later Romans improved upon the work of the Greeks. A fine example of a Roman map is the *Tabula Pentingeriana,* made in the reign of Augustus. It is interesting to compare this map with the sketch maps of primitive peoples. They differ greatly in the fact that the Roman map attempts to show the whole world as then known, while primitive map makers confine themselves to regions with which they are acquainted; but both are alike in having no degree nets, and in being little more than sketches of routes; and in both cases, the author tries to present the information of greatest importance to himself, other facts being almost ignored.

Ptolemy's maps were a turning point in the history of geography. They were superior to many maps of the Middle Ages. His work stimulated geographical research among the Arabs and, during the Renaissance, helped the development of cartography in Western Europe. The early maps of the Arabs show much knowledge of geography and care in drawing. They cannot be compared with the maps of primitive peoples, for many of them have a scientific basis, show astronomical determinations and represent vast areas. One Arab map, however, which attempts to show the course of the Nile from source to mouth, made in 1636, much resembles the primitive maps of to-day.

The maps of the Middle Ages have much in common with the maps of the early Greeks and Arabs and most of them were made by monks. The transition period, when map projections were introduced and surveys and measurements of the earth's surface began, connects the maps of the Middle Ages with modern map-making. It may be said, in a general way, that a comparison of the maps of civilized peoples in the old times with those of illiterate natives of the present day will often be in favor of the latter. The late Prof. S. Ruge, comparing the maps of old Germany with the primitive products of to-day, said that the maps made by Indians, Polynesians and Eskimo are more nearly correct than maps made by monks of the Twelfth century.

Summing up his long array of facts, Mr. Adler says that in the maps of primitive peoples, as a rule, we do not get the true orientation because bearings are based on the general directions of rivers, sea coasts, mountains, etc. The Yenisei Ostiak and the Marshall islanders are beginning to orient their maps by the cardinal points. The use of the compass is not generally known, but, when introduced, the natives at once see its advantages.

The materials used by primitive peoples depend on many conditions. Clay, sand and snow were first used in sketching maps, and these products most nearly approached those carved on stone. The Babylonians made maps on stone or baked clay even after parchment was known, preferring the durability of stone. Many of these maps have been preserved, while the wooden tablets of the Greeks and Romans have disappeared. The oldest Chinese maps were engraved on bronze urns, but as they were heavy, wood began to be used. Where the art of converting timber into boards was not known, bark was employed, and this is still used among nomad peoples. Later, maps drawn on leather or skins, textile fabrics and paper came into use. Among Mexicans, Chinese, Peruvians and others, maps on bark, wood or metal tablets were superseded by cotton and silk materials.

Tools used for drawing maps were first the finger tracing lines on sand or snow, then a stick, then a knife to carve wood. Then sticks dipped in coloring matter, pencils, charcoal, soot mixed with grease, etc., came into use.

The map technique of primitive peoples is naturally very simple as compared with our complicated processes. The technical requirements of a modern map are so great that in Germany, where the best maps in the world are made, three years frequently elapse from the time of the first survey drawing to the final printing of the map.

We make large and discriminating use of colors on maps, and different colors and different shades of the same color are used to express a large variety of meanings. A variety of colors is not found on the maps of primitive folk. Only one map is known, a Tchuktchi map already mentioned, which is colored with reindeer blood, on which deeper tints are used for fords, mountains, and the edges of forests.

Rivers and lakes are more likely to be shown than any other natural phenomenon. Sea coasts are often very incorrectly given, owing to the unfamiliarity of many tribes with coasts.

Routes come first among anthropogeographical elements shown.

Footprints are given to show the direction of movement; also sledge hunting roads in snow-covered countries; animal paths and fording places and human habitations, whether in the northern tundra or the tropical forest. A fish drawn on land means that there is fine fishing in the neighboring waters. Groups of dots on Wissner's Eskimo maps show where musk-ox herds may be found.

It is impossible in this brief summary to give an adequate idea of the thorough and detailed study of the primitive and early phases of map-making, the results of which are given in this quarto volume of 350 pages. The work embodies the fruits of the most exhaustive examination of this important subject that has yet been made. The author says modestly, in conclusion:

"The considerable material collected and presented here by us speaks for itself. If it should awaken further interest and stimulate further research and investigation, or be used as the basis for other works, we shall feel amply rewarded."

NOTES ON THE DESCRIPTION OF LAND FORMS.—VI.

A CUESTA IN MIDDLE GERMANY. DER STEIGERWALD: ein Beitrag zur Geographie Frankens, by J. Schwender (*Forsch, f. Deut. Landes- u. Volkskunde,* xvii, 1908, 1-118). The studies of German geography, among which the one above cited is published, are now approaching their twentieth volume. They consist of a series of essays by experts on various local themes, accepted with the sanction of a Central Commission for Scientific Geography in Germany, edited at present by Professor Hahn of Königsberg, and published by Englehorn in Stuttgart. The *Forschungen* may therefore be regarded as presenting the various methods of treating geographical problems that are accepted as scholarly and effective by German geographers of high standing. An essay by Sölch in a recent volume was reviewed in the fifth number of these notes, as an illustration of the helpful use of deduction, in addition to other mental processes, in geographical presentation. The essay here cited shows how greatly an approved method of treatment of land forms may vary from the deductive treatment employed by Sölch.

A part of Franconia in northern Bavaria, which, with respect to neighboring cities, lies between Würzburg, Bamberg and Nüremberg—or which, with respect to rivers, lies between a north bend of the Main and its southern branch, the Regnitz; or with respect to dimensions, measures about 70 kil. north and south by 50 kil. east and west; or with respect to structure, occupies a north-central part of the broadly truncated monocline of strong and weak strata that dip gently eastward and southeastward from the fundamental crystallines in the

stripped highlands of the Odenwald and Schwarzwald on the west, toward the strong cuesta determined by the uppermost resistant members of the monoclinal series, and known as the Franconian and Swabian Jura on the east; or with respect to topography, is finely portrayed on sheets 531 and 548 of the *"Karte des deutschen Reiches,"* 1:100,000; or with respect to geology, is shown on sheets 18 and 23 of Lepsius' *Geologische Karte des Deutschen Reiches,* 1:500,000—contains a beautiful example of a maturely dissected cuesta of moderate relief and delicate texture, known as the Steigerwald. To the south, the cuesta is continued in the Franken Höhe, but there it is of less delicate and definite expression; to the north, beyond the Main, it fades away with the change of structure encountered in the approach to the disturbed belt of the Thuringerwald.

In the district with which we are here concerned, every element of a maturely dissected cuesta of moderate relief and delicate texture is seen to perfection. Its crest, trending about north and south, and standing about 180 meters above the neighboring subsequent lowlands, maintains the fairly uniform elevation characteristic of this well-defined class of forms; its scarped western face, capped by the lower one of two resistant sandstones of small thickness, and indented by obsequent valleys in perfectly normal fashion, descends gently to the subsequent lowland worn down on the underlying weaker strata and here drained by the Main; its upland is somewhat benched or terraced, most distinctly so in the north, because the two determining resistant sandstones that maintain it are separated by a thin belt of weak marls; its very gradual eastward slope has been normally stripped of the overlying weaker strata of the monocline, which have retreated down the dip into the eastern subsequent lowland drained by the Regnitz, while the still higher and harder strata rise farther eastward in the strong cuesta of the Franconian Jura. The stripped eastward slope of the Steigerwald is, however, not smooth and even, as it might be in a young cuesta, but is maturely dissected; that is, it is elaborately carved by many beheaded consequent streams and their more numerous, somewhat insequent branches;—though for that matter it may be better to describe these consequents as resequents, in view of their presumable re-development after the far eastward retreat, probably in an earlier cycle of erosion, of the overlying Jura strata.

Guided by this description, one can imagine himself wandering over the cuesta, and easily conceive the wide prospect westward over the subsequent lowland of the Main, disclosed from the crest of the scarped slope; the picturesque re-entrants of the obsequent valley heads by which the face of the slope gains a pleasing variety of form; the occasional distant views from the uplands eastward across the subsequent Regnitz lowland to the Franconian Jura 40 or 50 kilometers distant; the long, slowly-descending strips of upland between the consequent (resequent?) valleys of eastward discharge; and the many small spurs of delicate texture between the short and somewhat irregular

branch-streams by which the sides of the consequent valleys are scalloped; all these features being conceived as having a mild expression, because the relief is at the outset described as moderate. Even an active physiographic imagination can hardly invent a more perfect type of a maturely dissected cuesta than the one that nature presents to us in the Steigerwald, in the middle of the broadly truncated Franconian monocline. When the large family of cuestas is monographed, as we hope it may be in the near future, the Steigerwald will surely have an important place as an unusually fine example that exhibits all the normal and systematic relations of structure, drainage and form, characteristic of the mature stage of cuesta development.

It is this exceptionally fine example of its prolific class that Schwender describes, partly empirically, partly genetically, in the first twelve pages of his essay—the remaning hundred pages being devoted to a more detailed discussion of population, settlement, traffic and local names. The first page, opening with the sentence:—"Steigerwald nennt man den Höhenzug, der sich zwischen Main, Aisch und Regnitz in nordnordöstlicher Richtung erstreckt"—continues with a detailed and purely empirical statement of the boundary of the district, phrased for the most part in terms of village names, but in the meantime the thing that is bounded remains practically unknown, except in so far as the vague term, Höhenzug, describes it. Then come three pages on internal structure, with abundant geological detail, all of which must be gone through by the reader not previously acquainted with the district, because it is not summarized, and not illustrated by a cross-section. Three or more pages follow on the origin of the Höhenzug, its form being still vaguely described; these pages are introduced by the elementary explanation that the overlying strata, now seen in the lower land to the east, once stretched westward over the Steigerwald, thus giving its district a much greater height, and that the strata of the Steigerwald itself once extended much farther westward, thus giving the mass a greater breadth. "The present Steigerwald is therefore only the remnant of a formerly much larger volume, and if we here treat of its origin, we must show how the small existing ridge has been produced from the once much greater mass, . . . and particularly how the retreat of the scarp in the direction of the dip of the strata is to be explained." This somewhat apologetic statement is followed by a rather roundabout explanation of the familiar lateral retreat of a monoclinal escarpment. Three more pages treat external form, and present various details regarding the scarp, the uplands and the eastern valleys, but with little relation to structure. Then the physiographic description is closed with two pages on "hydrographic relations," in which the various streams of the district are named and briefly characterized. In the remaining pages, other problems are treated in greater detail.

Through these twelve pages of Schwender's essay, the elementary problem of the Steigerwald cuesta is treated as if it were a novelty; as if this

"Höhenzug" were a unique form. There is no hint that another cuesta is to be found anywhere else in the world, no intimation that cuestas are familiar physiographic features. The reader gains no information as to the rank of the Steigerwald among its relatives; no intimation as to its being higher or lower, stronger or fainter, simpler or more complicated than other forms of its kind; not a suggestion even that it is a member of a class of forms. It stands alone; a waif, a foundling. There must, of course, be some good reason for the adoption of this method of isolated treatment by the author, for its sanction by the Central Commission for Scientific Geography in Germany, and for its acceptance by the editor of the *Forschungen;* but the reason is not immediately apparent..

A feature characteristic of isolated treatment is the insufficiency of technical geographical terms. True, in the section on internal structure, technical geological terms, such as *Schilfsandstein*, *Berggipskeuper* and *Lehrbergschichten* abound; in the mention of forests, there is no hesitation in saying that *Buchenwälder* clothe the scarp, and *Föhrenwälder* cover much of the uplands; or that *Nadelholz* prevails in one district and *Laubholz* in another; and in the account of the villages, each type of house-grouping is, following Schlüter, given a suggestive class name, such as *Strassendorf*, *Gassendorf*, *Platzdorf and Haufendorf;* but for the cuesta itself, no other name is employed than the altogether indefinite "Höhenzug." Other terms, such as "Rand" and "Abhang" for scarp, "Kamm" for crest, "Abdachung," for the slope of the upland, and "durchschnittene Hochfläche" for dissected upland, are more appropriate; but the use of these names for the parts by no means excuses the lack of a definite name for the whole.

A word used by some German writers for forms like that of the Steigerwald is "Stufe." Perhaps this term is avoided by Schwender as unsatisfactory because it is also applied by German writers to cliffs and benches of horizontal structure, while the essential features of form in the Steigerwald result from its structure being gently inclined. British usage sanctions, in a rather vague way to be sure, the use of "escarpment" for the whole mass of which the escarpment or scarp is, properly speaking, only the steeper side; confusion naturally results from giving the same name to a part and to the whole. "Lop-sided ridge" is an off-hand American suggestion that serves well enough colloquially, but that has not gained acceptance as a technical term. Veatch has recently suggested for American use the British word "wold." In the absence of any generally accepted term, Hill's earlier proposal of "cuesta" as a name, following Spanish-American usage, for unsymmetrical ridges of this kind has for some years seemed to me more satisfactory than any other, notwithstanding the objection urged by some that *cuesta* in Spanish means any sort of hill, and not only this particular kind of relief. A similar objection may, indeed, be used also against Richthofen's term, "ria" (*Führer für Forschungsreisende,* Berlin,

1886, 308), which in Spanish means, as Penck has pointed out, an open river mouth of any kind, and not specifically a bay formed by the partial submergence of a normal valley (Morphologie der Erdoberfläche, Stuttgart, 1894, ii, 566, note); yet ria has gained rather general acceptance in Germany, where cuesta is little used. In any case, it seems inexpedient, to say the least, to continue using vague words like "Höhenzug," or terms with other meaning, like "Stufe," or indefinite paraphrases like a "ridge of unsymmetrical slopes," for forms so definite in their relations and so common in many parts of the world as cuestas certainly are.

Consistent with his exclusion of a technical name for the "Höhenzug" of the Steigerwald, Schwender employs no technical terms to name the different kinds of streams by which it is so systematically dissected; and hence when streams are mentioned in the later chapters on roads, villages and so on, he has to resort to paraphrases, or else to local stream names which suggest no general relationships. In conclusion it may be fairly said that one seldom meets with a regional description in which a brief systematic introduction, phrased in appropriate technical terms and simply illustrated, would be more fitting, and in which the absence of such an introduction more seriously embarrasses a reader not already acquainted with the ground.

Amateur Geography. In *Nature* for Dec. 8, 1910, page 178, is a paragraph commenting on the recommendation made in these Notes (xlii, 1910, 671-675) that technical explanatory terms and phrases should be more generally employed in geographical articles than is now the case. The comment says, in a remonstrating tone, that explanatory terms "might be more misleading than any empirical description if employed wrongly or applied without sufficient warrant. It is not every traveller who could be trusted with the use" of such terms, even though they "may be used with good effect by a physiographer of experience."

On the same page of *Nature*, or on neighboring pages, one may read that fishing is dangerous "where *Glossina palpalis* is found"; and mention is made of a harmful insect, "*Denoderus minutus*"; also of a "*grass-like umbellifer, Aciphylla glacialis*," and of "the valuable gold-lip, *Margaritifera maxima*"; and so on, in abundance. Yet none of these scientific or explanatory terms excite remonstrance; in none of these cases is it urged that technical terms "might be more misleading than any empirical description if employed wrongly or applied without sufficient warrant"; and no fear is expressed that "not every traveller" can be trusted with the use of these learned words.

What then is the ground of discrimination against geography in this matter? Why is it that an effort to reach a fair degree of proficiency and expertness in this worthy, but undeveloped old science, arouses misgivings? Perhaps the reason is that *Nature* counfounds travellers and geographers, although it does not confound travellers and zoologists, travellers and botanists, or travel-

lers and ethnologists. But what have mere travellers to do with the question? The article regarding which the note in favor of the development and use of technical terms was written, did not appear in the records of a traveller's club, where amateurs might very properly entertain themselves and each other with dillettante narratives of their distant experiences, but in one of the leading geographical journals of the world. There, if anywhere, is it fair to look for expert geographical work; and if an article in such a journal bears the mark of the scientifically untrained traveller, and not of the trained geographer, it is reasonable to urge that it should be improved in the way of geographical proficiency.

Consider what would happen if that entertaining person, the traveller, should present an untechnical account of his observations on certain plants to the Linnæan Society, and ask for its publication in their journal; assume for a moment that publication was granted, and that the members of that learned society were thus informed regarding the occurrence of a flower, in which the flower-stems spread out from a common center, so that the blossoms met above in a gently convex surface of approximately circular border. Imagine then that a botanist on reading this naive story should suggest that "such flowers might be more briefly described as umbellifers." Would *Nature* then comment on such a suggestion by saying that "a term like umbellifer might be more misleading than any paraphrase if wrongly employed"? Comments of that kind would be perfectly true; but they would be mere truisms, and in the case of botany and zoology *Nature* would not make them. Why then, in view of the progress of these organic sciences as cultivated by experts, does *Nature* assume that geography must remain a subject for amateurs only?

My acquaintance with *Nature* extends intermittently over about forty years. I recall various occasions on which its editorials and reviews have taken advanced ground in favor of high scientific standards, and no occasion previous to the one here instanced, in which it urged investigators to restrain their efforts towards progress because mistakes might be made if their terms and explanations were wrongly employed by uninformed persons; no case in which this famous scientific journal advised that thoughtful effort towards progress in geography or in any other subject should be decreased because "travellers" are not always technically educated. To find that articles in the best geographical journals of the world are still largely the work of "travellers," little informed regarding the scientific description of the earth's surface, is already discouraging enough; but to find that *Nature* should use its large influence in favor of lagging behind with geographical amateurs, instead of urging geographers to take the pace that it sets for other sciences, is disappointing indeed.

W. M. Davis.

GEOGRAPHICAL RECORD

AMERICA

A RAILROAD'S FOREST ENTERPRISE. The Canadian Pacific Railway Company for years past has promoted the agricultural development of the Canadian Northwest by establishing experiment stations, demonstration farms, irrigation enterprises and in other ways. The company holds large areas of forest lands in different parts of Canada, notably in British Columbia. *American Forestry* (July, 1911) says that the company has now turned its attention also to forestry. Its purpose is primarily to develop thorough protection for the great forest wealth along the lines of the road. The necessity for this effort has been demonstrated by the enormous destruction among these Canadian forests in 1910 and other recent years. In addition to this work of fire protection the company plans also the establishment of a regular forest service to take charge of certain forest tracts and develop on them a system of forestry suited to the country, to the forest, the land and climate and to the economic conditions of the different regions in which the forests are to be selected. At present the company has in its service a number of educated young foresters in addition to its old staff of experienced timber men.

PROFESSOR BOWMAN IN PERU. Professor Isaiah Bowman is now in Peru as Geologist-Geographer of the Yale Peruvian Expedition of 1911. The general plans of the expedition have already been noted in the *Bulletin* (April, 1911, p. 287). From Santa Ana, in the Urubamba Valley, Professor Bowman's division of the expedition will travel north and east, down river, to the Sepahua or the Mishagua tributaries, ascend one of these, and cross over to the Alto Purus on the Madre de Dios. From a point a short distance east of the eastern border of the Andes a return will be made to Santa Ana and south along the 73rd meridian to the Pacific and eventually to Arequipa, the headquarters of the expedition. The main objects of the geologic and geographic work are: (1) a physiographic study of a belt of country extending from the Amazon basin to the Pacific across the Andine Cordillera; (2) a geologic reconnaissance, including studies of structure and the collection of fossils for the purpose of throwing light on the stratigraphy of this portion of Peru; (3) the effect of exposure, varying precipitation, and declivity upon the position of the snow line; (4) the limits and effects of Pleistocene glaciation; (5) soil and water supply studies in relation to vegetation; (6) a study of the artificial terraces or andenes and their relation to olimatic change in the region; (7) anthropogeographic work in the various natural regions traversed, with special reference to the distribution of people. The return to New Haven will be made about December 18th. Mail may be addressed to Arequipa, in care of Grace & Co.

INDUSTRIAL AND PRODUCTIVE LIFE OF PERU. The June number of *Peru To-Day* is devoted to a review of the industrial and productive life of Peru. A great deal of information is presented in condensed form. Official records are supplemented from private sources and some hitherto unpublished statistics are given.

ASIA

MASSACRE OF EXPLORERS. The *Geographical Journal* (May, p. 571) announced the murder of Mr. Noel Williamson, Assistant Political Officer at Sadiya, who was recently killed (date not given) on the Assam-Tibet Borderland by the wild Abors of that region. They also massacred nearly all the members of his party, about 200 in number. Mr. Williamson had hoped to win the friendship of the Abors, and if possible, to trace the unknown course of the Brahmaputra (Dihong) River, which is the lower course of the Tibetan Tsanpo River. It is said that the Abors, while professing peaceable intentions, fell without warning on Mr. Williamson's party, which was practically annihilated.

The part of the Brahmaputra which Mr. Williamson desired to explore is that which Major L. Darwin in his last presidential address before the Royal Geographical Society referred to when he said that "the bend of the Brahmaputra is still drawn by guess work on our maps." About ninety miles of the river through this mountainous frontier region is still unknown because no white explorer or Indian traveler has been able to cross the region through which it passes. The Abor tribes for many years have kept all strangers from traversing their country.

The question of the sources of the Brahmaputra was therefore for many years a geographical conundrum. Native Indian explorers had traced the Tsanpo River in whose valley live most of the Tibetans, to within ninety miles of the known Brahmaputra. There they were stopped by the Abor mountaineers. Some geographers held the view that the Tsanpo was the upper part of the Brahmaputra, while others long affirmed that it was probably the source of the Irawadi River of Burma. It was not till 1886 that explorers conclusively proved that the Iriwadi had no connection with the Tsanpo. They showed that the headstreams of the Irawadi rise far east of the Tsanpo on the slopes of the Nankin Snow Mountains, and that high mountain ranges separate the basins of the two rivers. Some of the Indian explorers marked logs and set them afloat in the Tsanpo, thinking it probable that they would be picked up in the known part of the Brahmaputra. None of these logs seem to have been found in the lower river; but exploration to the east and west of the Abor country at last afforded sufficient evidence that the Tsanpo could be nothing else than the upper part of the Brahmaputra. The ninety mile gap in the river, however, still remains unexplored.

The British have twice sent punitive expeditions against these mountaineers, but the inhospitable tribes are still unconquered. The first white victims of the Abors are believed to have been Krick and Boury, who were killed in 1850.

THE ABSENCE OF RELIGIOUS CONCEPTIONS AMONG THE KUBUS OF SUMATRA. An interesting paper with this title by Prof. W. Volz of Breslau University is published in *Petermanns Mitteilungen* (Vol. 57, I, pp. 288-292). The paper deals with two problems: (1) Is it possible that a part of the Kubus tribe may, in consequence of its environment, have been preserved in its primitive state? (2) Is there a human being totally devoid of even the most rudimentary religious conceptions?

In the discussion of the first problem, Prof. Volz says that the Kubus are a primitive tribe inhabiting the central forest region of southern Sumatra between 2° and 3° S. They number roughly 8,000, but of these by far the greater part have been brought into contact with Malay civilization, and through its in-

fluence are in possession of rudimentary religious concepts. It is only with the small minority who remain in a primitive state that the paper deals. These primitive Kubus live in the interior forest of Sumatra, the central of the three longitudinal provinces into which the southern part of the island is divided. Adjoining it on the N.E. is a zone of mangrove swamps, extending as far as 35 miles inland from the coast. Belonging rather to the domain of the sea than to that of the land, offering food to practically no living creature—the mangrove region is not fit to be the habitation of man.

On the S.W. it gradually merges with the interior forest, which, in its turn, is bounded on the S.W. by the mountain ranges accompanying the western coast of Sumatra, which form the third natural province. Nor is the interior forest an inviting abode for man. For hundreds of square miles it extends in an unbroken, leafy canopy, through which even the birds do not penetrate. Of the Malays who have entered this region on the larger rivers, not a few have perished from want of food, although equipped with gun and ammunition. This, then, is the home of the Kubus. They are extremely few in number. Their life is one of such hardship that it is certain that they have never materially increased in numbers.

Given this environment, Prof. Volz argues that it is highly improbable that the Kubus have ever been affected by the early Malay invasions. Such an inhospitable region is not likely to have been the objective of former migrations. It is only since the advent of the European that the Malays are, by degrees, penetrating into this region under his direction, for the sake of its products, and gradually encompassing the scattered remnants of the tribe, with extinction the inevitable result. All the more reason for prompt action in the study of this primitive people before it is too late.

The state of development of the Kubu is a further argument in favor of the assertion that he has remained in the primitive state. His life is comparable to that of the gibbon, an anthropoid ape that inhabits the same forests as himself. His quest of food is the same. The Kubu is in the lowest stage of economic development, that of the gatherer. He lacks the impulse of the hunter, whose desire to overcome his prey is an important factor in the development of his mental faculties.

Finally, it stands to reason that the complete isolation of the Kubu has dwarfed his mental development. He has lacked the mental stimulus of contact with his fellow-men, be it of a peaceful or antagonistic nature. Prof. Volz feels that the evidence is conclusive that the Kubus who have not come into contact with the Malays have preserved their primitive state of development.

The second question, *viz.*, whether a total lack of religious conception is possible in man, Prof. Volz answers in the affirmative, basing his belief on various theoretical considerations, but more especially on his personal investigation of the Kubus. W. L. G. J.

AUSTRALASIA AND OCEANIA

Exploration of New Guinea. The exploration of New Guinea is advancing rapidly. Although several of the expeditions now in the field have suffered momentary reverses, the experience gained is a guarantee of their ultimate success. The expedition under Capt. Scheffer was forced to abandon its plan of crossing the island from south to north on account of the illness of its leader. It practically completed, however, the survey of the Eilanden River, which

empties into the Arafura Sea in 5°50′ S. lat., tracing it to its source in the central range at an elevation of about 11,500 ft., between Wilhelmina Peak and Juliana Peak, about 60 miles east of the former. In his attempt to reach Carstensz Peak in the central range by way of the Idenburg River, an eastern tributary of the upper Mamberamo, Dr. M. Moskowski inadvertently followed the western tributary, which had already been traveled, and reached the foot of the central range. Compelled to return because of lack of food, he had the misfortune to lose his ethnographic collections and the maps embodying the results of his surveys in a boat accident. Dr. W. Goodfellow, the ornithologist, whose objective was the same peak of the central range, was also forced to desist from his quest on account of illness. The Idenburg River, mentioned above, is being explored by an expedition under Lieut. de Wal, which started last May with a view to determining the feasibility of using this river as a line of attack in the attempt to cross the island from north to south. (*Pet. Mitt.*, 1911, I, pp. 305-306, based on various sources.)

Anthropological Expedition to New Guinea. The University of Oxford is about to send out an anthropological expedition to New Guinea supported by grants from the Common University Fund and a number of the colleges, with contributions also from a few private friends of the expedition. *Nature* (June 15, 1911, p. 530) says that the Committee for Anthropology has selected Mr. D. Jenness of Balliol College to undertake the work of exploration. Mr. Jenness holds the Oxford diploma in Anthropology and has also had practical experience of the conditions of camp life in the bush. He expects to reach Papua in November and his base of operations will be Bwaidoga on Goodenough Island, one of the almost unknown D'Entrecasteaux Group off the southeast coast of New Guinea. He will probably begin his labors with a general survey of this Group, but as soon as he is thoroughly in touch with the natives he hopes to settle down to a detailed study of Goodenough Island in particular.

EUROPE

Exhibit of Plans of Rome. An interesting exhibit of plans of Rome showing the development of the city since about 1500, forms a part of the Retrospective Exhibit displayed in the Castle of Saint Angelo in connection with the International Exposition now being held in the Italian capital. The most important piece in the collection is one of three originals of the manuscript Pianta di Roma, drawn by Leonardo Bufalini in 1551. The value of Bufalini's work lies in the fact that his map of Rome represents relief. In the avoidance of the practice, so common to medieval cartographers, of superimposing on the ground-plan, perspective views of prominent buildings, Bufalini is also far in advance of his contemporaries. The following two centuries were a period of retrogression, rather than of advance, as shown by the maps in the collection. A return to Bufalini's methods inaugurates a new era of development marked by the publication, in 1748, of Nolli's map, on which ground-plan and relief are combined. The subsequent maps covering the period up to 1870 do not essentially differ from it in treatment; they show, however, the improvement in methods of reproduction. Some of the newer maps, however, are less satisfactory than the older ones in their representation of relief, a condition brought about by the growth of the built-up areas of the city, which renders it more difficult to effect a satisfactory compromise between the representation

of streets and of topography. This is unfortunate, as with regard to few cities does the topography play so important a part as in the case of the City of the Seven Hills. (*Pet. Mitt.*, 1911, I, pp. 310-311.)

THE LÖTSCHBERG TUNNEL. The new route through the Alps by way of the Lötschberg tunnel will not shorten the routes to Rome from Paris and Germany, but will considerably decrease the mileage from London and Northeastern France. It will be two years yet before trains will be crossing the Bernese Oberland. The nine-mile tunnel is largely the enterprise of Bern. Ever since the completion of the Simplon tunnel in 1905 the business men of the federal capital have felt that other cities of Switzerland were getting most of the local benefit from the roads through the St. Gotthard and Simplon tunnels that connect the rail routes of Italy and north Europe. The St. Gotthard tunnel serves traffic to and from Lucerne, Zurich and Basel and the Simplon is directly connected with Geneva. But Bern, between the two, was isolated from both.

After studying the question of a feasible route that would bring through trains to Bern, it was decided to utilize the railroad extending from Spiez on Lake Thun to Frutigen. It was found that the railroad could be extended from that point without much difficulty up the Kander Valley to Kandersteg. Here began tunneling which took four years and five months. The rest is comparatively easy work, laying the track down the Lötschenthal to the Rhone and up that river to connect with the Simplon tunnel at Brieg. The Lötschberg tunnel is a little shorter than the St. Gotthard, and three miles shorter than the Simplon.

UPPER LIMITS OF FOREST TREES IN SCANDINAVIA. Mr. C. Rabot of *La Géographie* summarizes in that journal for April his own work and that of others relating to the upper limits of forest trees in Scandinavia. He comes to the conclusion that the retreat of these upper limits is to be attributed to a lowering of the summer temperature, which has been estimated at 4.5° F.

POPULATION OF BULGARIA. The population of Bulgaria on Dec. 31, 1910, was 4,329,108, an increase of 7¼ per cent. in five years. The area of the country being 37,200 square miles, the number of inhabitants to the square mile is 116. North Bulgaria had a population of 2,373,649 and a density of 124, South Bulgaria of 1,955,459 and 109, respectively. (*Pet. Mitt.*, Vol. 57, I, p. 302.)

POPULATION OF DENMARK. On Feb. 1, 1911, the population of Denmark was 2,757,076, an increase of 6½ per cent. in five years. Its area being 15,042 square miles, the density of population was 184. With the addition of the Faroe Islands the figures for the entire kingdom are 2,775,076, 15,582 square miles and 179, respectively. The population of Copenhagen, inclusive of Frederiksborg was 559,398, an increase of 8.8 per cent. in five years. The next city in size was Aarhus, with 61,755 inhabitants. Thirteen other cities of Denmark had a population greater than 10,000. (*Pet. Mitt.*, Vol. 57, I, p. 302.)

POLAR

CENSUS OF DANISH GREENLAND. The census of Dec. 31, 1909, shows that the native population of West Greenland is slowly increasing. In 1909 there were 4.4 births and 3.4 deaths among each 100 inhabitants. The population was 12,414, or 94 more than in 1908. The station of Angmagsalik on the east coast in 1909 numbered 554 natives, or nine more than in the preceding year. These facts

are interesting inasmuch as the Eskimo race appears to be decreasing in many parts of its habitat, while under the Danish administration in Greenland the number is augmenting.

AMUNDSEN'S BASE OF OPERATIONS. A letter from Capt. Roald Amundsen dated Feb. 9, 1911, was brought north by the exploring vessel *Fram* and is published in the *London Times* (Weekly Edition, June 9, 1911). He gives the reasons why he made his headquarters on the Barrier Ice a little to the west of Edward VII Land at the point along this remarkable ice wall where Captain James Clark Ross in 1842 observed a large indentation or bay in the wall. In 1900, Borchgrevink, the Norwegian explorer, entered this small bay and thence climbed up to the Barrier Ice surface, which he found stretching southward as a wide, level plain as far as the eye could see. Later this bay was seen by Capt. Scott; and Sir Ernest Shackleton entered it in the course of his expedition of 1908, and named it Bay of Whales. Because this bay had been observed at intervals for over sixty years, Amundsen decided that it must be an enduring formation and would afford a safe harbor in which to unload his expedition.

The day after he sighted the Barrier he reached this bay, which is in about 164° W. Long. His theory of the origin of the bay is that the sea shoals where the bay exists and the mighty glacier was thus forced out on either side, forming thus a great indentation in the ice wall.

The *Fram* was safely moored to the ice in the bay, and on Jan. 16, 1911, the party began to unload the cargo. The house was erected on top of the Barrier Ice, 150 feet above the surface of the bay. The Greenland dogs, 115 in number, picked for their hauling qualities, slowly pulled the heavy laden sledges up to the site. The solidly built house stands safe and secure, sunk four feet down in the snow as hard as rock and supported by back stays on all sides. Amundsen named it "Framheim" and it stands in about 164° W. Long., 78°40′ S. Lat. It is the most southerly habitation yet built in the Antarctic. Fifteen tents were set up around the house for the use of the dogs and as storerooms for food supply, coal, wood, clothing, etc. The food depot contains provisions sufficient for two years. Up to the time the *Fram* left, the party had lived almost entirely on seal meat, which Amundsen writes he would not exchange for any other dish in the world. Seals were found in large numbers and he expected soon to secure an adequate winter supply for his party and the dogs.

"It is my intention," he wrote, "to lay down a main depot in 80° S. Lat., and a smaller one as far south as possible; and I hope that, with the excellent means at our disposal, we shall get to 83° with the smaller depot in the Autumn, before the dark season sets in. I can say nothing more with regard to our future prospects. We shall do what we can."

It thus appears that Amundsen has pitched his headquarters not on land, but on the Barrier Ice itself; that his base station is somewhat nearer the Pole than that of any previous explorer; and that if he succeeds in planting a food depot at 83° S., he will establish food supplies farther south than other explorers have been able to do on their journeys preparatory for their main advance.

ANTARCTIC EXPEDITIONS. The *Geographical Journal* (July, 1911) announces that Mr. Pedro Christofferson, a Norwegian living in Buenos Aires, has offered to bear all the expenses of Capt. Amundsen's *Fram* for provisions and other outfit during the ship's work in the Antarctic, and until the final arrival in San Francisco.

Dr. Mawson, the leader of the projected Australian Expedition, has acquired

a suitable vessel—*Aurora,* built at Dundee in 1876—and the necessary preparations are going forward under the superintendence of Capt. Davis. The equipment will include an aeroplane.

AN EXPEDITION GOING TO CROCKER LAND. While Peary was engaged during a part of 1906 in completing the coast survey of northwestern Grant Land, he saw to the Northwest a region which he named Crocker Land and which is the most northern land yet known to exist on the globe. We learn from the American Museum of Natural History that an expedition has been organized for the scientific exploration of Crocker Land. It will be led by Prof. D. B. Macmillan and Mr. George Borup, who were members of Peary's North Pole party in 1909. It is hoped that Peary's ship, the *Roosevelt,* will be acquired for the expedition, which is expected to cost about $25,000. It is hoped to start north in June next year and, if possible, work the ship north and west to Cape Columbia, which will be the advance base from which the journey to Crocker Land will be made by sledge. The expedition hopes to do a large amount of important work in the locality mentioned, and expects to be away from home about three years. It is said that several scientific bodies and private individuals are contributing financial support. Capt. R. Bartlett is making a trip to Etah this summer to arrange for the men, dogs and food which will be taken on board the exploring vessel in the summer of 1912.

PHYSICAL GEOGRAPHY

SEA WEED IN THE SARGASSO SEA. Dr. John J. Stevenson, who recently sailed across the Sargasso Sea, reports his observations briefly in *Science* (Dec. 9, 1910). He says that the "indefinite descriptions of the area and mass of seaweed, as well as the extraordinary statements made by some authors in discussing the origin of coal, induced the writer to make an examination of the conditions for himself. The matter is easy, because the steamship route between Barbadoes and the Azores crosses the area diagonally and passes very near the center. His own observations, and the information gained from officers who had crossed the Sargasso Sea many times, lead him to think that "much depends on the time of year, for weed appears to accumulate while the Trades are mild and to be broken up later in the season when the strength of the winds increases. In any case, however, the weed occupies only a small part of the area, the patches being separated by wide spaces of clear water, almost free from weed. Many of the bunches show unmistakably that they had been attached to rock; and the plants have traveled far, since in a large proportion of bunches only a part is living, the dead parts being of a brownish color. In passing through the Bahamas the seaweed is found to be "much more abundant than along either of the lines followed across the Sargasso. The weed is evidently the same, being in circular bunches up to 18 inches diameter arranged in strips according to the direction of the wind, though occasionally in bands or even in patches eight by ten feet. The patches are near the large islands.

"At best, the quantity of weed seen at any locality is wholly insignificant. Midway in the Sargasso Sea, the bunches seen in a width of a mile would form, if brought into contact, a strip not more than 65 feet wide. This, where the weed is most abundant. But the bunches are very loose, the plant material, as was estimated, occupying less than one-fifth of the space and if the bunches were brought together so that the plant parts would be in contact, each square mile would yield a strip not more than 13 feet wide and 3 or 4 inches thick,

or barely 2,500 cubic yards to the square mile. . . . The accumulation of decayed vegetable material from seaweeds must be comparatively unimportant under the Sargasso sea; and what there is would be merely foreign matter in mineral deposits."

PERSONAL

Prof. W. M. Davis sailed from New York on July 22 for Queenstown to begin in Ireland the summer field work in physiography, the plans for which were described in the August *Bulletin*. Prof. Mark Jefferson expects to join Prof. Davis's party early in August.

Dr. H. C. Cowles of the Department of Botany, University of Chicago, sailed in June to spend six months in Europe. He will take part in an excursion of plant geographers in England, spend some time in France and Switzerland, and be present at the meeting of the Tenth International Geographical Congress at Rome in October.

Dr. Sven Hedin has been elected a member of the Paris Academy of Sciences.

GENERAL

NEW EDITION OF THE CENTURY ATLAS. The Century Co., New York, announces that a new edition of the Century Atlas will be published in the autumn. This atlas, which forms a part of the Century Dictionary and Cyclopedia, is particularly valuable because of its large-scale maps of the several States and of the Provinces of Canada. Of these regions it can be said to afford the best cartographic presentation among general atlases published by private firms. The following is an extract from the preface to the new edition:

"In the new edition several of the maps, particularly that of Alaska and the different maps of Canada, have been entirely remade, and all the others have been thoroughly revised; the railroads have been brought down to date; incorporated places not included in previous editions of the atlas have been added; the index has been reset and includes the results of the United States census of 1910, and entirely new maps of the South Polar region, of Oklahoma, and of the interurban trolley connections in the north central States, and the northeastern States have been added."

ARIDITY, SALT DEPOSITS AND CURRENCY. The use of blocks of rock salt for building purposes or as currency, in regions of great aridity, is one of the most obvious illustrations of climatic control over human customs. In a recent description of the salt plain which lies to the east of the Abyssinian tableland, Major A. Tancredi (*Boll. Soc. Geogr. Ital.*, Feb., 1911) brings out some striking facts regarding the climate of that district. The plain lies somewhat over 100 meters below sea-level, and forms an area of inland drainage. The mean temperature is about 88° Fahr., and the summer maxima are said to reach 122° Fahr. The salt deposits of the region furnish blocks of rock salt which are used throughout the country as currency by the Abyssinian merchants. These blocks rise rapidly in value towards the more remote western parts of the tableland.

R. DEC. WARD.

PHOTOGRAPHS DESIRED BY THE U. S. WEATHER BUREAU. This Bureau is forming, in its library at Washington, a collection of meteorological photographs and will welcome additions thereto from all parts of the world. It would like photographs of observatories, apparatus, meteorologists, clouds, rainbows, lightning and its effects, etc.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Maryland Weather Service. Vol. 3. Pp. 533. Pls. XXXIX. Figs. 15. The Johns Hopkins Press, Baltimore, 1910.

The Maryland Weather Service has set a standard of climatological work in the United States which does the State of Maryland, and all those who have been active in these investigations, the highest credit. In 1899 there appeared Vol. I, a splendid report of more than 550 pages, fully illustrated, containing "A General Report on the Physiography of Maryland," by Cleveland Abbe, Jr., and a "Report on the Meteorology of Maryland," by Professor Cleveland Abbe, Sr., E. J. Walz and Dr. O. L. Fassig—a volume which the present reviewer then characterized as "bahnbrechend." In 1907 came the second volume, of over 500 pages, containing a discussion of the climate and weather of Baltimore, by Dr. O. L. Fassig, so complete that it ranks with European climatological investigations, and has done much to relieve the unpleasant, but wholly deserved criticism which has so often been made against American meteorology by our European colleagues.

Now we have the third volume, which we welcome as a fitting companion to the other two. The present volume is a fine example of what the reviewer has often termed *economic climatology*. It shows clearly how important is a knowledge of the broader outlines of climatology in any investigation of plant life. Following the first two volumes in logical order of succession, we have in the third volume the application of the principles laid down in the other two. The fullest, the most effective, the highest use of climatological data is to be found, not in the mere tabulation and summarizing of these data, but in the study of the relation of the atmospheric conditions, which these data show to prevail, to man, to his industries, his use of the soil, his health, his general development. To many, probably, the admirable studies of "The Plant Life of Maryland," by Messrs. Forrest Shreve, M. A. Chrysler, Frederick H. Blodgett and F. W. Besley, which are included in this volume, will seem somewhat out of place under the title of Maryland Weather Service. But to us it seems that Professor William B. Clark and his associates have done a piece of work in economic climatology which as logically belongs among the investigations of a meteorological service as does a detailed study of the temperature, the rainfall, or the winds. We are glad to note, in the Preface, the statement: "Other lines of work suggested or inaugurated include a more detailed study of the swamp lands which are so intimately connected with the climatic conditions of the State that their study, in part at least, falls within the province of the State Weather

Service. The far-reaching influence of climate on the economic and social development of communities suggests investigations upon the relation of agricultural soils to physiographic and climatic features, and the bearing of climate upon health."

The volume contains an introduction, which is a summary of the climatic factors upon which plant growth depends; upon the topography of the State and its relation to vegetation and upon the mineralogy and soils of Maryland and their bearing upon plant growth. The titles of the chapters, *e. g.*, "Floristic Plant Geography of Maryland," "Ecological Plant Geography of Maryland," "The Relation of Natural Vegetation to Crop Possibilities," "Agricultural Features of Maryland" and "The Forests and their Products," show clearly the scope of the investigations and their practical bearings. As a whole, the third volume of the Maryland Weather Service is fully up to the standard of the two preceding volumes. R. DEC. WARD.

SOUTH AMERICA

Across South America. An Account of a Journey from Buenos Aires to Lima by Way of Potosí. With notes on Brazil, Argentina, Bolivia, Chile, and Peru. By Hiram Bingham. xvi and 405 pp., maps, illustrations and index. Houghton Mifflin Company, Boston and New York, 1911. $3.50. 8½ x 5½.

The best part of this book, less than half its bulk, deals with Dr. Bingham's ride along the old trade route between Buenos Aires and Lima, from Quiaca to Oruro in southern Bolivia, and from Cuzco to Huancayo in Peru. His zeal for Spanish American history led him into many a weary day and night of dreary discomfort. Geography is not his topic, so we hardly find an attempt at adequate description of land or people. Apart from details of travel, his attention is directed to campaigns and routes of trade mainly. Yet we gather a distinct impression for the route traversed of fertile, sheltered valleys, sunk thousands of feet beneath bleak, rolling desert *paramos*, of a wretched people barely existing in a land that is poor and populated to the full, more densely than ever before. It is good to get this view, for Peru has been overpraised. But probably this view too might be overdone. There are great disadvantages under which people live in the Andine valleys, but some of them are not hopeless of improvement. Incidentally, the pains of Peruvian and Bolivian travel should inspire a certain respect for the disparaged peoples who undertake it unmurmuringly.

Two route plans well illustrate the itinerary, but the printer has interchanged them and put each in the wrong context (pp. 80 and 280). They show no topography. The pictures are good geographically, but uneven. Especially fine is the Uspallata Pass. The reader will feel the author's discomfort on the old overland trail.

Interwoven with this narrative are *impressions de voyage* along the author's way to the pan-American scientific congress at Santiago, Chile. The east coast of Brazil, the Argentine and Chile are made to fill 200 pages, with notes on somewhat familiar regions.

Dr. Bingham has little sympathy with the native Spanish Americans. The reviewer feels that they have many admirable qualities, less readily perceived by the casual visitor than their differences from us. Why should their willingness to wait till eleven for breakfast be disparaged? They are quite as early risers as we. As for their contention that they are *Americans*, while we are

North Americans, it is no more unreasonable than our attitude. It is simply the custom of speech in South America, in Spain and in Italy as in parts of France. With us and in Northern Europe another habit prevails. There is something in the old rule "When in Turkey do as the Turks."

MARK JEFFERSON.

Das Flussgebiet der Ribeira de Iguape im Süden des Staates S. Paulo (Brasilien). By Gustav Stutzer. 120 pp., 18 maps and illustrations. W. Süsserott, Berlin, 1910.

The author of this monograph knows his subject intimately and gives in unpretentious form a great deal of useful information with respect to nearly the entire district in the southern part of the Brazilian state of São Paulo on the Ribeira and its affluents. Topography, climate, flora, fauna, minerals, population, means of communication, etc., are all discussed fully enough to create a presumption in favor of Herr Stutzer's main contention, namely, that Central and North European agricultural laborers and peasants have comparatively little reason to fear the "hazard of new fortunes" in this region, which (although its mineral resources have often been absurdly overestimated) undoubtedly possesses exceptionally rich soils and navigable waterways that facilitate transportation. The climate is overpraised. M. W.

Uruguay. By W. H. Koebel. 350 pp., map, illustrations, appendix and index. Charles Scribner's Sons, New York, 1911. 9 x 6.

Koebel's various writings on Latin-America are recognized as carefully prepared and of authoritative value. The present volume may be welcomed as one of the best collations of well-arranged facts we have in English concerning Uruguay. A third of the volume is given to the history of the country. Then follow chapters on Uruguayan manners and customs, the aboriginal tribes, the geography of the Republic, Montevideo and other cities, the Uruguay River, the Campo, Estancia life, Uruguay as a pastural country, her political divisions, climate and natural history, her industries and natural wealth, communications and commerce. In the appendix are many statistical tables and a good index makes all information readily available. The map is helpful, though it gives no idea of the topography of the country.

AFRICA

Sur les hauteurs du Katanga du lac Moero à Lukafu. Par le Commandant Jules Morisseau. Itinéraire du Prince Albert de Belgique. 85 pp., and illustrations. Imprimerie scientifique, Charles Bulens, Brussels, 1910. Fr. 1.

A brief, sketchy account of the author's journey from Kilwa on Lake Moero southwest to Lukafu in the province of Katanga. It describes the route afterwards traversed by the present King of Belgium several years ago. A chapter on the pacification of this most southeastern province of the Belgian Congo, is included. A considerable number of photo-engravings show aspects of the country.

La Conquête du Sahara. Essai de psychologie politique. By E. F. Gautier. 260 pp. Armand Colin, Paris, 1910. Fr. 3.50.

A book by Mr. Gautier on Saharan problems is always interesting, either politically or geographically, or in both ways. So it is in the case of this book. In the first two chapters the author tells us his version of the conquest of the

Tuareg Sahara by France, which is based on much new evidence collected on his travels, and which destroys several legends that had developed about the events of the early eighties. The bit of humor with which he seasons his argument makes it so much pleasanter reading. The third chapter is devoted to the "méharistes," *e. g.*, the cavalry of natives riding on the "méhari," or Africa dromedary. The entrance of the méhari into the service of the French marks the turning point in the struggle of France for the subjection of the desert. After many fruitless attempts by European riders to use that animal for military purposes, the problem was finally solved by enlisting members of the Chaamba, an Arabian tribe from the country to the south of Wargla, as their riders. A variety of circumstances combined to make the Chaamba the right material for this experiment. They had long been under French government, nominally since 1854, and the French had also acquired a certain authority with them by the fact that they had discovered artesian wells in their country. This proved a useful lesson on the advantages that might accrue to them through the contact with European civilization, and while among the older people distrust has not yet quite disappeared, the younger generation has, slowly but steadily, felt the taming influence of the changed conditions, and they have become friends of the French. In that character the Chaamba have acquired a certain prestige among their fellow tribes, because what had formerly been the Tuareg Sahara is now the Chaamba Sahara, owing to the fact that the profession of policemen proved to them more attractive than that of banditti.

By limiting their drill to the indispensable minimum of military discipline, and interfering with their habits and wants as little as possible, their organization has been made efficient to a degree never reached in modern colonial history. They are loyal to their service, which is not felt as a burden by them, and by their intimate acquaintance with the ways of the méhari they get as much out of the animals as the nomadic natives do, and this means everything, of course, in a country where, with French riders, these animals had been sacrified by the thousands on fruitless expeditions through the desert.

If the Chaamba are the most useful inhabitants of that country, the Tuareg are certainly the most interesting from the ethnographical point of view, and must be assigned a place by themselves among their fellow tribes. It is almost certain that they were originally a white race which received an admixture of negro blood after settling on African soil. There is much in their manners and customs that challenges comparison with those of Europe and although Mohammedans by name, they do not speak Arabic. It is not impossible that they are descendants of the Moors, the conquerors of Spain, who, in the seclusion of their desert home, were not reached by the changes which their Moroccan cousins have since experienced. The name even of Tuareg seems to be a corruption of an old Berber word; an alphabet which was used for epitaphs by the old Berber peoples, and which is not known in modern Barbary, is still in use among the Tuareg, and for the sole purpose of making inscriptions on rocks, too.

Besides these traces of ancient Berberian relations, they have preserved other relics of the past which even antedate these. Their social system is distinctly matriarchal; they observe a number of taboos of decidedly pre-islamitic origin, and their axes, although made of iron, are exact counterparts of neolithic ones, *viz.*, the iron terminates in a heel which is fastened, by means of a thong, in an opening of the wooden handle.

Their isolation in the center of the desert resembles that of those South Sea Islanders among whom similar reminiscences of prehistoric ages have been preserved. But the Tuareg are the only example of a white population living as nearly as this under neolithic conditions; they are the men of Cro-magnon stepped forth from their cavern.

The archaism of their institutions forms a striking contrast with their high intellectual qualities. They have especially a highly developed geographical instinct. They answer geographical questions willingly and clearly, and illustrate their answers by drawing diagrams in the sand, so that they have often acted as competent guides to the explorers of their country. In Bissuel's book on the Adrar-Ahnet Mts., for instance, large parts were written from the dictation of a Tuareg captive in Algiers, and the map which accompanies that book is the reproduction of a relief map made by that same Tuareg during his captivity. This map was the only foundation, from 1885 to 1905 for the cartography of that country; even now, with our increased knowledge of the latter, it is, although imperfect, tolerably correct, and considering the circumstances under which it was made, it must be called marvelously good. The knowledge of the Tuareg, too, of the oases and watering places is so extensive and accurate that without the information obtained from them the exploration of the Sahara might even to-day be more imperfect, and include greater risks, than that of the Polar countries. To win that intelligent tribe for the service of the French would be a great step toward the civilization of the desert.

Of the Trans-Saharan Railroad, too, the author says a few words. Without feeling as enthusiastic over the project as some of his literary colleagues do, he is perfectly convinced, not only that such a road is possible, but also that the national as well as international advantages to be derived from it would be large enough to justify its construction. M. K. GENTHE.

Kamerun als Kolonie und Missionsfeld. Von P. Steiner. Verlag der Basler Missionsbuchhandlung. Basel, 1909.

The little volume is only of missionary interest. It tells the history of the work of the different protestant missions in that country, especially of the Basel mission. The geographical part is not original, and the map places the missionary stations so much in the foreground that it has little value for general purposes. The index contains a list of literature on Cameroon, which, though not complete, has several references which may not be generally known.

M. K. GENTHE.

ASIA

An Illustrated Guide to the Federated Malay States. Editor, Cuthbert Woodville Harrison, Malay Civil Service. 333 pp., map in pocket, illustrations and appendices. The Malay States Development Agency, London, 1911. 2s. 6d. 6½ x 4½.

This excellent little book describes the Malay Peninsula from north to south, from Penang to Singapore. The region seems to open an attractive new field to the globe trotter. The book says there is no unrest in Malaya. The country is quiet, the people content, and the town streets and country roads are perfectly safe. The people who are now called the aborigines, that is, the Negrito and Semi-Negrito wild tribes who inhabit the jungles, are the first inhabitants of the peninsula known to its history. But there existed before the Negrito, the pre-

Tuareg Sahara by France, which is based on much new evidence collected on his travels, and which destroys several legends that had developed about the events of the early eighties. The bit of humor with which he seasons his argument makes it so much pleasanter reading. The third chapter is devoted to the "méharistes," *e. g.*, the cavalry of natives riding on the "méhari," or Africa dromedary. The entrance of the méhari into the service of the French marks the turning point in the struggle of France for the subjection of the desert. After many fruitless attempts by European riders to use that animal for military purposes, the problem was finally solved by enlisting members of the Chaamba, an Arabian tribe from the country to the south of Wargla, as their riders. A variety of circumstances combined to make the Chaamba the right material for this experiment. They had long been under French government, nominally since 1854, and the French had also acquired a certain authority with them by the fact that they had discovered artesian wells in their country. This proved a useful lesson on the advantages that might accrue to them through the contact with European civilization, and while among the older people distrust has not yet quite disappeared, the younger generation has, slowly but steadily, felt the taming influence of the changed conditions, and they have become friends of the French. In that character the Chaamba have acquired a certain prestige among their fellow tribes, because what had formerly been the Tuareg Sahara is now the Chaamba Sahara, owing to the fact that the profession of policemen proved to them more attractive than that of banditti.

By limiting their drill to the indispensable minimum of military discipline, and interfering with their habits and wants as little as possible, their organization has been made efficient to a degree never reached in modern colonial history. They are loyal to their service, which is not felt as a burden by them, and by their intimate acquaintance with the ways of the méhari they get as much out of the animals as the nomadic natives do, and this means everything, of course, in a country where, with French riders, these animals had been sacrified by the thousands on fruitless expeditions through the desert.

If the Chaamba are the most useful inhabitants of that country, the Tuareg are certainly the most interesting from the ethnographical point of view, and must be assigned a place by themselves among their fellow tribes. It is almost certain that they were originally a white race which received an admixture of negro blood after settling on African soil. There is much in their manners and customs that challenges comparison with those of Europe and although Mohammedans by name, they do not speak Arabic. It is not impossible that they are descendants of the Moors, the conquerors of Spain, who, in the seclusion of their desert home, were not reached by the changes which their Moroccan cousins have since experienced. The name even of Tuareg seems to be a corruption of an old Berber word; an alphabet which was used for epitaphs by the old Berber peoples, and which is not known in modern Barbary, is still in use among the Tuareg, and for the sole purpose of making inscriptions on rocks, too.

Besides these traces of ancient Berberian relations, they have preserved other relics of the past which even antedate these. Their social system is distinctly matriarchal; they observe a number of taboos of decidedly pre-islamitic origin, and their axes, although made of iron, are exact counterparts of neolithic ones, *viz.*, the iron terminates in a heel which is fastened, by means of a thong, in an opening of the wooden handle.

Their isolation in the center of the desert resembles that of those South Sea Islanders among whom similar reminiscences of prehistoric ages have been preserved. But the Tuareg are the only example of a white population living as nearly as this under neolithic conditions; they are the men of Cro-magnon stepped forth from their cavern.

The archaism of their institutions forms a striking contrast with their high intellectual qualities. They have especially a highly developed geographical instinct. They answer geographical questions willingly and clearly, and illustrate their answers by drawing diagrams in the sand, so that they have often acted as competent guides to the explorers of their country. In Bissuel's book on the Adrar-Ahnet Mts., for instance, large parts were written from the dictation of a Tuareg captive in Algiers, and the map which accompanies that book is the reproduction of a relief map made by that same Tuareg during his captivity. This map was the only foundation, from 1885 to 1905 for the cartography of that country; even now, with our increased knowledge of the latter, it is, although imperfect, tolerably correct, and considering the circumstances under which it was made, it must be called marvelously good. The knowledge of the Tuareg, too, of the oases and watering places is so extensive and accurate that without the information obtained from them the exploration of the Sahara might even to-day be more imperfect, and include greater risks, than that of the Polar countries. To win that intelligent tribe for the service of the French would be a great step toward the civilization of the desert.

Of the Trans-Saharan Railroad, too, the author says a few words. Without feeling as enthusiastic over the project as some of his literary colleagues do, he is perfectly convinced, not only that such a road is possible, but also that the national as well as international advantages to be derived from it would be large enough to justify its construction. M. K. GENTHE.

Kamerun als Kolonie und Missionsfeld. Von P. Steiner. Verlag der Basler Missionsbuchhandlung. Basel, 1909.

The little volume is only of missionary interest. It tells the history of the work of the different protestant missions in that country, especially of the Basel mission. The geographical part is not original, and the map places the missionary stations so much in the foreground that it has little value for general purposes. The index contains a list of literature on Cameroon, which, though not complete, has several references which may not be generally known.

M. K. GENTHE.

ASIA

An Illustrated Guide to the Federated Malay States. Editor, Cuthbert Woodville Harrison, Malay Civil Service. 333 pp., map in pocket, illustrations and appendices. The Malay States Development Agency, London, 1911. 2s. 6d. 6½ x 4½.

This excellent little book describes the Malay Peninsula from north to south, from Penang to Singapore. The region seems to open an attractive new field to the globe trotter. The book says there is no unrest in Malaya. The country is quiet, the people content, and the town streets and country roads are perfectly safe. The people who are now called the aborigines, that is, the Negrito and Semi-Negrito wild tribes who inhabit the jungles, are the first inhabitants of the peninsula known to its history. But there existed before the Negrito, the pre-

historic men, of whom traces are found all over the world. Their stone implements may be seen in the Museum at Taiping. The peninsula itself is a curious historical museum, showing every grade of primitive culture, and here and there are monuments and inscriptions that were in existence before the Malays came in the Fifteenth century.

The book contains a large amount of authoritative information about the Federated Malay States, as well as ample guidance for the tourist. All important towns are described, motor trips are outlined, the opportunities for big game shooting are noted, the contents of museums outlined, and also the attractions of boat journeys on the Perak River, the native theatres, etc. Much attention is given to tin-mining, Para rubber planting and other industries. The illustrations, which include very pleasing colored views, and the map are excellent.

Letters from China. With Particular Reference to the Empress Dowager and the Women of China. By Sarah Pike Conger. xv and 392 pp., 80 illustrations, map and index. A. C. McClurg & Co., Chicago, 1909. $2.75. 8½ x 5½.

Mrs. Conger, the wife of our former Minister to China, lived seven years in that Empire, during which she had many opportunities to gain clear ideas of the country and of the real character of the Chinese. Her book is composed of many of the letters she wrote to her relatives at home, and she arranged them for publication in the belief that they would help to correct widespread and erroneous views concerning China and the Chinese. Few books have been written that give so intimate a picture of the many things she describes, and her position opened for her the doors to many aspects of the land and people that are not seen by most travelers. The book has a valuable place among works on China in the English language.

Strange Siberia Along the Trans-Siberian Railway. A Journey from the Great Wall of China to the Skyscrapers of Manhattan. By Marcus Lorenzo Taft. 260 pp., illustrations and index. Eaton & Mains, New York, 1911. $1. 7 x 4½.

A small book, with more meat than is found in many books of travel four times as large; nor does interest flag on any page. Its descriptions are clear, it gives the real atmosphere of town, farm, steppe and mountain, and shows the influences that are shaping men and things in the Russian Empire. The chapters on "Irkutsk" (population about 100,000), "The Jews in Russia" and "The Steppes" are especially noteworthy. It has a good index and is worth it.

The Nāga Tribes of Manipur. By T. C. Hodson. xiii and 212 pp., map, 17 illustrations, appendices and index. Macmillan and Co., Ltd., London, 1911. $3. 8½ x 5½.

These tribes live by agriculture in the hill country which forms the larger part of Manipur in eastern Assam adjoining Burma. Each tribe has a definite place in the family of Tibeto-Burman languages and in their area is a rich variety of dialects, due to the confluence of at least two streams of language. The tribes do not intermarry, and thus variety in customs as well as in dialects is encouraged. But all are headhunters; and the author is careful not to lose sight of the essential unities that underly the diversities among these peoples. He collected his material ten years ago with great care and thoroughness, and

his book is a well-arranged and detailed study of these little-known tribes in relation to their geographical distribution, domestic life, laws, customs and religion. The volume concludes with specimens of their folklore. Most of the many authorities he quotes deal with anthropological and ethnological topics in general, and not with his special field of study; but all his citations from these works have direct relation to phases of the tribes he is describing.

Le Sultan, L'Islam et les Puissances. Constantinople—La Mècque—Bagdad. Par Victor Bérard. Avec deux cartes hors texte, iii and 443 pp. Librairie Armand Colin, Paris, 1907. F. 4.

This book, written a short time before the removal of Abdul Hamid from the sultanate, throws many interesting sidelights on the political situation preceding that event. In the first part the author discusses the difference between the Arab and Turkish parts of the Ottoman empire. The two races are separated by the Taurus Mountains, so that the realm of the Turks comprises Asia Minor, and that of the Arabs extends on the other side of that range to the Gulf of Persia and the Sinai Mts., and farther through the Arabian peninsula to the Indian Ocean. Although the country is ruled by the Ottoman government, and inhabited by Christians, as well as Mohammedans of all denominations, the Arabian element dominates, and Arabic is the common language of the people.

Between these two parts of the empire extends the "step" (*-thagr*), a border region inhabited by nomads and brigands: Armenians, Turkomans, Tcherkesses, Kurds and others, which prevents any intimate relation between the two sides.

This large Arabian part of the empire has never been quite reconciled to the Turkish government, and in one place or the other it has always been in a condition of latent or open rebellion. Former sultans were content to govern Asia in the Turkish way as long as their armies secured the throne, the cities and the highways, and they left the open country more or less to itself. The effect was that, whenever lack of money affected the readiness of the army, there was, all over the Arabian country, a sudden springing up of liberators, prophets and brigands, who menaced the unity of the empire.

Abdul Hamid II was the first to use a different policy. Without underestimating the power of the army, he tried at the same time to satisfy and please his Arab subjects. This fact explains many of his acts, which otherwise would appear not only criminal, but most unwise. In his public and private life, his foreign and domestic policy, there is, perhaps, not one of his acts but was intended to win the confidence of the Arabs—but at the same time contributed to endanger the future of the Turks and Turkey. To be sure, he had dangerous chiefs imprisoned and even poisoned on the slightest suspicion; but on the other hand, he chose Arabs for his advisers and secretaries, established an Arabian bodyguard beside the Turkish one, and although his official ministers and counselors were Turks, the real power behind the throne was in the hands of a camarilla of Arabs, who knew exactly how to rule him by taking advantage of his foibles. The result was that the Turks, grieved at this state of things, found a friend in England that had long been nervous on account of the growing influence of Germany at the Yildiz Kiosk. She was only too willing to act as the advocate of the oppressed, especially because there were not only the Turks, but also the Christians, who had to suffer from these Arabian influences. Thus, with the Sultan, the Arabs and the Kaiser on one side, and the Turks, Christians

and the Foreign Office on the other, the author almost foretells the course of events which afterwards justified his forecast.

On the occasion of the twenty-fifth anniversary of his accession to the throne, Abdul Hamid II promised the believers, among other things, the building of a telegraph and railroad line to Mecca in order to spare the pilgrims the necessity of using the boats of the Giaurs. This project had, however, a very worldly side, because from the oldest times, and long before Mohammed, Mecca had been the crossing of the two great roads that control traffic on the Arabian peninsula, a north-south one between Syria and Yemen, and a west-east one from the Red Sea to the Gulf of Persia. With the Red Sea in the hands of the English, the construction of an overland route through that country under Turkish control was a national and political, as well as religious, enterprise.

Considering the close relations between Arabia and Africa on one hand, and the extension of that railroad into Syria on the other, it is evident that that road would, when completed, control the nearer East from Asia Minor to Abyssinia. It is with some apprehension, therefore, that the author, as a Frenchman, watches the progress of Germany in Syria and Palestine and the sale by England of the Syrian railroad concessions to a German syndicate, so that Germany might eventually control nearer Asia, from the Mediterranean to the Red Sea and, in coöperation with Turkey, also the land route to India. He already sees Barbarossa resuscitated to complete his conquest of the Holy Land.

With all these forces at play, the value of that railroad for those in whose interest it was claimed to be constructed seems somewhat problematical and, by way of the Turco-German "tyranny" and the Syrio-English agitation, it may benefit in the end,—like so many enterprises, and especially railroads, in the Turkish empire—nobody but the French or German companies who will install themselves on the ground that has been prepared by others.

The story of the Bagdad railroad is very much like that of the Pilgrim road. It had, too, long been planned by England and Turkey combined, but, in the exultation over the building of the Suez Canal, England lost view of it and Germany promptly stepped in. If the jealousies and apprehensions of one's competitors are a gauge of success, German readers of that book may feel safe about the prospects of their railroads in the Near East, and while the author's opinions on that subject may not be entirely unbiased, the book remains nevertheless a scientific and up-to-date study of the situation on that much coveted territory, and in spite of its more political character it does not neglect the geographical side of the subject. M. K. GENTHE.

Outlines of Agriculture in Japan. iv and 132 pp., map and illustrations. Published by the Agricultural Bureau, Department of Agriculture and Commerce, Tokyo, 1910. 9 x 6.

The work was compiled to acquaint foreigners with the general outlines of the agriculture of Japan. The two features that characterize Japanese farming are (1) that the cultivation of rice has the leading position, the value of the rice crop being equal to that of all the other agricultural industries; and (2) that farms are very small and farming is intensive. Seventy per cent. of the farmers till only 2.45 acres or less. All the farmers who cultivate more than 7.35 acres of land each do not exceed three per cent. of the total number of agriculturists. The result of the enormous population and of the small area of the fields is that methods of cultivation are necessarily intensive and crops are generally

raised twice a year from the same farm. Many younger nations are now giving much attention to the maintenance of the fertility of the soil. They may well study the methods of Japan, whose soil has for ages been forced to produce enormous quantities of food and is still kept in the highest state of fertility. The book tells how every particle of fertilizer produced at home is utilized in the field, even to weeds, the ashes of plants, and the sweepings of the streets, in addition to the large quantity of commercial fertilizers imported from abroad. The work discusses all phases of Japanese agriculture and is a very useful contribution to our knowledge of the greatest activity of the Japanese people.

Mining in Japan. Past and Present. Published by The Bureau of Mines, The Department of Agriculture and Commerce of Japan. 1909. v and 322 pp., and maps. 10 x 6½.

This work was especially prepared to give information regarding the past history and the present condition of mining in Japan. Its maps show the distribution of the metals and the coal and oil fields of the empire, and the text, treating each mining industry separately, describes its history and development with more detailed information as to the most important mines and oil fields.

EUROPE

Early Britain. Roman Britain. By Edward Conybeare. 275 pp., map and index. Society for Promoting Christian Knowledge, London, 1911. 3s. 6d. 6½ x 4½.

A trustworthy and readable sketch of the historical growth and decay of Roman influence in Britain, illustrated by the archælogy of the period. Seventy-seven ancient authors are referred to, and all of the best modern authorities were consulted. The book gives 123 pages to pre-Roman Britain, 36 to the Roman conquest, 64 to the Roman occupation and 51 to the end of Roman Britain. A chronological table and list of authorities are included.

British Mountain Climbs. By George D. Abraham. xvi and 448 pp., illustrations and index. Mills & Boon, Ltd., London, 1909. 7 x 4½.

A handy book for the pocket and a conveniently small and concise guide to the British rock-climbs, the result for the most part of the author's personal experience. British mountain climbers find much recreation and enjoyment among the higher elevations of Wales and Scotland, and not a few of the climbs described in this book require roping if the climbers take sensible precautions against accident. The author groups these British climbs around the most convenient centers and mentions the most helpful maps at the beginning of his leading chapters.

Swiss Mountain Climbs. By George D. Abraham. xv and 432 pp., illustrations and index. Mills & Boon, Ltd., London W., 1911. 7s. 6d. 7 x 4½.

A work that all Alpinists will appreciate. It is full of suggestions with regard to the most popular and important climbs among the Alps. Sketch maps show the best routes to many summits. The book includes a considerable number of climbs of no great difficulty and seems to encourage even those who are in no sense mountaineers to attempt some of them. The author says:

"Few Englishmen, aye, and even women if they be sound of wind and limb, but can tackle an average Alpine ascent. Good strong trustworthy guides are

available, and these stalwarts are capable of looking after matters of equipment and taking their patrons anywhere in reason. They are becoming past-masters in tactful discrimination, they 'temper the wind to the shorn lamb' ".

In the Abruzzi. By Anne Macdonell: With Twelve Illustrations after Water-Colour Drawings by Amy Atkinson. ix and 309 pp., map and index. F. A. Stokes Company, New York, 1909. $2. 8½ x 5½.

The land of the Abruzzi is due east of Rome, beyond the nearer heights that bound the Campagna. This region is supplied with railroads and other highways, but travelers, and even most Italians know little of it. Only recently have the Abruzzi come to be visited by tourists, though the region is wonderfully picturesque and contains also the relics of great art, though they must be sought for because they are not gathered into collections, but are scattered among unfrequented valleys or quaint little towns or remote mountain sides.

This book will help to make the Abruzzi better known and to attract visitors to this highland region. The author has written very carefully and shows many aspects that make the Abruzzi worthy of the attention and admiration of a wider public. She fully describes both the country and the people. The colored views are an interesting feature.

The Cathedrals of Northern France. By T. Francis Bumpus. x and 396 pp., map and illustrations, appendix and index. James Pott & Company, New York, 1910. 7½ x 5.

The cathedrals here described are north of the Loire as far as the confluence of the Allier River, and thence north of a straight line, joining the Allier mouth with the Ardennes. The usefulness of the book as a touring companion is increased by grouping the great churches in their respective archiepiscopal provinces. Twenty-seven pages are given to a sketch of the development of the French cathedrals, which is followed by descriptions of twenty-five of them. The book is the outcome of years of study and observation, and will be very useful to all travelers who wish to know more of the ecclesiastical "glories of France."

Les Grands Ports de France, leur Rôle économique. Par Paul de Rousiers. vii and 258 pp. Librarie Armand Colin, Paris, 1909. F. 3.50.

Geographers interested in the influence of location, environment and political conditions, on the rise and decline of human settlements, owe the author special gratitude for this book. He first establishes a classification of seaports, according to their functions, which he designates as commercial, regional or industrial. The commercial function is the oldest, because the ports originally served only as depots and points of distribution for ocean goods; it is the prominent function of many ports even to-day. The regional function came to the front when the economic development of the respective hinterlands was so far advanced that their exports determined the character of the ports; and the youngest of the three, the industrial function, was due to the advantage of working up raw materials from abroad as near the place of their importation as possible. Ports which occupy a commanding position in the world's trade must have more than one function nowadays, and the time of one-function ports seems gone by. The large and fast ships of the present require enormous quantities of freight to make their trips pay, and neither of these functions alone can furnish enough traffic for any port to make it worth while for modern vessels to call there.

From these points of view, the author determines the respective functions of the great ports of France, and their influence on the development of these functions.

Dunkirk seemed to be limited to the function of a merely commercial or strategic harbor; it was one of the few protected places on a dangerous coast, and had no natural connection with the hinterland. But when the cotton and beet sugar industries of northeastern France developed, and the natural outlet of that region, Antwerp, was on foreign territory, a national port had to be created and an artificial connection, the Lille-Dunkirk Railroad, was established between the isolated port and the hinterland. Thus Dunkirk became a regional port contrary to all geographical conditions, and as such it is now having a degree of prosperity never known under the old régime.

In the case of Havre, one would expect a mainly regional port, owing to its location at the mouth of one of France's largest rivers. But the contrary is the case, because the shallow and unreliable course of the lower Seine is an obstacle, rather than an encouragement, to commerce upstream. Havre, therefore, has been at all times, and is even now, pre-eminently a commercial port, more especially the great international coffee market of Europe. Her business men represent the pick of their class from France, England, Belgium, Germany, and their combined efforts have made the place what it is to-day. As they are mostly foreigners, however, this prosperity does not seem to rest on a very safe basis, because, if they should ever find another place more suited for their business, they would turn their backs on Havre. It is fortunate, therefore, that the advent of the railroad has given it a chance to become also a regional port for the cotton industry of Normandy, and this function might be greatly extended if the country were not in the grip of one railroad company, so that for purposes of transportation, Bremen is a nearer port to central and eastern France than Havre. It is therefore difficult to secure enough return freight for the large steamers that leave cargoes there. Attempts have been made to start a number of industries near the port, the products of which are expected to supply this need. Thus, the regional and industrial functions may preserve the commercial factor in its original intensity.

Rouen, on the other hand, is a typical example of the working of favorable geographic conditions. It is at the head of navigation, and owns the first bridge that spans the river. Thus built on both banks of the river, it controls the country on both sides in addition to that upstream which, to make the advantages of its location complete, includes Paris. Hence, Rouen has always been a thriving port and a wealthy city, and there is no prospect of a change in the near future, as the railroads centering there have only served to intensify its relations with that vast and progressive hinterland.

Nantes one would expect to be the Rouen of the Loire and of Orleans; but in spite of the sameness of geographical environment, its functions were radically different, owing to political conditions. Nantes never was the regional port of the Loire country, because under the old régime, when France was divided into a number of commercial provinces, it was made the port of Brittany, with which it had almost no connection. Its only possibilities, therefore, were on the high seas, and thus Nantes became the seat of West Indian traffic and a kind of French Hanse town, which amassed fabulous wealth by trade in sugar and "black ivory." The rise of the beet sugar industry, and the emancipation of the slaves, proved, of course, deadly blows to this prosperity, and even the letting up of the artificial barrier between it and the hinterland could not avert the decline,

because in the meantime railroads had connected that hinterland also with other ports, and the shallow Loire was inadequate for navigation with modern boats, so that it could not even maintain the competition by a cheaper waterway. Nothing but deep sea fishing was left to the descendants of the Nantes Vikings, and a few industries which have been started there more recently are far from sufficient to give the place any of its former importance. Nothing but the improving of the Loire waterway can redeem the situation by allowing the port at last to come into its own as the regional port of that large part of France which geographically belongs to the Loire and its tributaries.

The same causes which deprived Nantes of its natural hinterland, gave one to La Rochelle, which was, by nature, as isolated as Dunkirk. The division of France into commercial provinces made La Rochelle the port of "La province des 5 grosses fermes," *e. g.* the Loire country. It owed this preference, probably, to the fact that, between independent Nantes in the north and Bordeaux in the south, which used to be English as much as French, it had been, through all the Middle Ages, the only royal port on the western coast. When its monopoly fell, railroads had come to supply connections where nature had not provided for them, so that the port did not suffer from the change. Indeed, the needs of the Nineteenth Century brought out a new advantage of its location, because it was as near the coal fields of England on one side as it was of the parts of France in greatest need of that article on the other. Its business, therefore, went on increasing so much that a new harbor was built at La Pallice, and this harbor, with its modern facilities, in its turn attracted there more traffic, and especially the large transatlantic steamers that began to find Bordeaux inadequate for their needs. Owing to such improved chances for ocean transportation, a large part of what was originally Bordeaux hinterland has become tributary to La Rochelle and this process is still continuing.

Bordeaux is thus falling considerably behind in the race, and this is owing to several causes. Its former supremacy rested on a purely commercial basis, namely, on the trade with Santo Domingo and the West Indies generally, which was killed by the loss of that colony. It still had the wines of the Gironde country to fall back on; but the demand for those wines has considerably decreased, both at home and abroad. The hinterland, or what is left of the hinterland, owing to the competition of La Rochelle—La Pallice, is not progressive, it has remained stationary for generations and it is self-sufficient to-day as it was centuries ago. The only regional freight handled at Bordeaux at present is the pine timber from the Landes, which is exchanged for coal from England. Like Nantes, Bordeaux has taken to fishing to make up for the falling off in its trade, and its suburb of Beigles bids fair to become the Gloucester, Mass., of France, as thirty of the thirty-eight drying establishments of France are located at this place. Recently the location at Bordeaux of the rubber market of France promises to give its trade a new impetus. The greatest problem of the present is, however, how to increase the exports of the place, for there is a constant lack of return freight for the steamers that unload there. As the hinterland is not likely to fill this want in the near future, it is only by creating local industries that Bordeaux can hope to regain some of its former prominence, which the commercial function alone has not been able to maintain.

Marseilles, finally, has always been the largest port of France, in spite of varying geographical and historical conditions. It owes this superiority to its excellent commercial opportunities. For all parts of western Europe, it is the nearest port on the Mediterranean to embark for the Orient, and since the open-

ing of the Suez Canal it is the door even to the Far East; it is the only port of the Rhone valley, and in addition, the port par excellence for the African possessions of France. While the regional opportunities, too, seem larger than those of any other French port, its regional function is not, however, as important. The passenger traffic alone is proportionate to it; but for freight the connections of the upper parts of the Rhone valley are much better via the Atlantic ports than downstream, where navigation is far from satisfactory. There is some danger that even the unexcelled commercial position of Marseilles may be shaken if the regional function, or the industrial, continues to be thus disregarded. For a great international port like this needs domestic traffic to keep the foreign trade going, and of the domestic kind, Marseilles has too little for modern conditions. Like Bordeaux, Marseilles has begun, therefore, to supplement its business by industrial pursuits, but they suffer from the lack of adequate facilities for transportation from the factory to the port, which often costs as much as the freight all the way from Marseilles to the Black Sea, as almost all the goods must be carted. The construction of a barge canal is therefore under discussion, and there is no doubt that in this way the whole region would receive a new impetus which would considerably benefit the business of the port.

M. K. GENTHE.

GENERAL

Geographisches Jahrbuch. XXXIII. Band, 1910. Herausgegeben von Hermann Wagner. Gotha, Justus Perthes, 1910. 472 pp. 15 marks. 9 x 5½.

The current edition of this indispensable summary of the literature of all branches of geography is mainly devoted to general geography. The progress made in cartography (projections, map drawing, cartometry) in 1906-08 is reviewed by Dr. H. Haack (pp. 119-204); in dynamic geology in 1903-04 by Dr. E. Tams, pp. 79-118 (this division represents a part of the section formerly entitled "Fortschritte der Geophysik der Erdrinde," edited by Prof. E. Rudolph); in regional geology in 1907-09, by Prof. Toula (pp. 205-314); in oceanography in 1903-09, by Dr. L. Mecking, pp. 395-454 (formerly in the hands of Prof. Krümmel); in geographic meteorology in 1906-08, by Dr. W. Gerbing (pp. 3-78); in plant geography in 1905-09, by Dr. L. Diels, pp. 315-394 (a section that has been in Prof. Drude's hands for nearly 30 years). The usual systematic index of the whole cycle embraced by the summaries of the Jahrbuch enables one to determine in which volume is to be found the most recent review of any given subject.

W. L. G. J.

Vergleichende Untersuchungen über Flussdichte. Von Ernst Puls. Dissertation, Universität Kiel. pp. 39. Hamburg, 1910. 9 x 5½.

An investigation of the density of the drainage systems of certain typical districts, based on planimetric and curvimetric measurement, respectively, of their areas and their water courses. Drainage density is represented by the quotient of the area of a district divided by the length of its water courses. Two districts in the Northern Plain and five in the Central Highlands of Germany are discussed together with one example each of an Alpine and a Mediterranean district as represented by the region adjoining the Jungfrau and by the province of Attica.

W. L. G. J.

NEW MAPS

EDITED BY THE ASSISTANT EDITOR

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Maps in U. S. G. S. Bulletins.

MINNESOTA. (a) Topographic Map of Southern Minnesota, by O. E. Meinzer. 2 colors. [Relief in contours, interval 100 ft.]. (b) Map of Southern Minnesota Showing Thickness and Character of Surface Deposits, by C. W. Hall, O. E. Meinzer and M. L. Fuller. 7 symbols in colors. (c) Map of Southern Minnesota Showing Occurrence of Granitic Rocks and Sioux Quartzite, by O. E. Meinzer. 10 symbols and colors. (d) Map of Southern Minnesota Showing Underground Water Conditions, by C. W. Hall, O. E. Meinzer and M. L. Fuller. 16 symbols in colors. All four maps: 1:750,000 approx. (1 in.=11.8 miles approx.). (45°25′-43°30′ N.; 96°26′-91°16′ W.). Accompany, as Pls. I, II, III and IV "Geology and Underground Waters of Southern Minnesota," by C. W. Hall, O. E. Meinzer and M. L. Fuller, *Water Supply Pap.* 256, 1911. [Map (a) the basis for maps (c) and (d).]

TEXAS. (a) Geologic Map of Texas. [1:7,500,000 approx. (1 in.=118.4 mile approx.).] Black. (b) General Geologic Map Showing Location of Burnet and Llano Quadrangles, Texas, with principal quarries, mines and prospects. 1:750,000 (1 in.=11.84 miles). (31°15′-30°10′ N.; 99°15′-97°35′ W.). 3 colors. (c) Economic and Geologic Map of Llano Quadrangle, Texas. 1:125,000 (1 in.=1.97 miles). (31°0′-30°30′ N.; 99°0′-98°30′ W.). Topography surveyed in 1898-99; culture revised in 1909. Geology surveyed in 1908-09. 12 colors. [Geology superimposed on topographic map; contour interval 25 ft. Elevations 8 ft. too high.] Accompany, as Pls. I, II and III, "Mineral Resources of the Llano-Burnet Region, Texas, with an Account of the Pre-Cambrian Geology," by S. Page, *Bull.* 450, 1911. [Map (a) modifies and supplements geology of trans-Pecos Texas as given on the geologic map of North America, 1:5,000,000, compiled by Gannett and Willis, 1906. Region represented on maps (b) and (c) is the area of pre-cambrian and paleozoic rocks N.W. of Austin exposed by erosion above the surrounding Cretaceous strata.]

WYOMING. (a) Map of Lander Oil Field, Wyoming, with sections. By E. G. Woodruff. 1:63,360 (1 in.=1 mile). [Oriented N. 31° E.]. (43°15′-42°40′ N.; 108°55′-108°30′ W.). 10 symbols in colors. With index map showing general location. [Relief in contours, interval 100 ft.]. (b) Map of Salt Creek Oil Field, Natrona County, Wyoming. By C. H. Wegemann, assisted by R. W. Howell and W. Mulholland. 1:63,360. (43°30′-43°12′ N.; 106°30′-106°7′ W.). 1 color. Accompany, as Pls. I and VII, "The Lander and Salt Creek Oil Fields, Wyoming," by E. G. Woodruff and C. H. Wegemann, *Bull.* 452, 1911.

WEATHER BUREAU

WORLD. [Three charts representing:] (1) Annual average isobars; isotherms of air; cold ocean currents; warm ocean currents, land. 3 colors. [Gall's cylindrical projection: mean scale 1:300,000,000 approx.]. (2) Normal wind directions and velocities for January and February. 1 color. (3) Normal wind directions and velocities for July and August. 1 color. [Maps (2) and (3) on Mercator projection: equatorial scale 1:240,000,000 approx.]. Accompany, as Figs. 1, 2 and 3, on pp. 9, 10, 11, paper on "Origin of the Permanent Ocean Highs," by W. J. Humphreys, *Bull. Mt. Weather Obs.*, Vol. 4, Part 1, pp. 1-12, 1911.

BUREAU OF ETHNOLOGY

MEXICO AND CENTRAL AMERICA. Linguistic Map of Mexico and Central America. By C. Thomas, assisted by J. R. Swanton. 1909. 1:7,000,000 approx. (1 in.=110.5 miles approx.). (33°-7° N.; 118°-77° W.). Accompanies treatise with similar title by same authors, *Bull.* 44, 1911. [Distinguishes between 30 linguistic stocks, exclusive of subdivisions.]

NORTH AMERICA

UNITED STATES

LOUISIANA. [Map of] Forest Regions [of] Louisiana. Field Examination by J. H. Foster, Feb. and March 1910. [1:3,750,000 approx. (1 in.=59.2 miles).] Black. Accompanies, on p. 414, "The Case of the State of Louisiana," *Amer. Forestry*, Vol. 17, pp. 414-423, 1911.

WISCONSIN. (a) General Plan for District of the Four Lakes, Madison, Wisconsin. 1910. [1 in.=1 mile (1:63,360). Scale incorrectly given on original.] (43°10′ - 43°55′ N.; 89°30′ - 89°12′ W.). Black. [Based on U. S. G. S. topographic sheets. Relief in contours, interval 20 ft. Woods shown.] (b) The Park System of the City of Madison, Wisconsin. 1909. Approximate scale 850 ft.=1 in. (1:10,200). 2 colors. (c) A Suggestive Plan for Madison, a Model City. [1 in.=½ mile. (1:31,680.) Scale incorrectly given.] 3 colors. [Relief in contours, interval 20 ft. Comprises nearer environs of Madison.] All three plans by John Nolen, Landscape Architect, Cambridge, Mass. Accompany "Madison: A Model City," by John Nolen, Boston, 1911.

NORTH AMERICA. U. S. Biological Survey Fourth Provisional Zone Map of North America. By C. H. Merriam, V. Bailey, E. W. Nelson and E. A. Preble. 1910. [1:40,000,000 approx. (1 in.=631.3 miles approx.).] 6 colors. Frontisp. of "Check-list of North American Birds prepared by a Committee of the American Ornithologists' Union," 3rd edition (revised), New York, 1910. [The fourth edition of this standard map of the bio-geographic provinces of North America.]

SOUTH AMERICA

ARGENTINA. Die Vorkordillere zwischen den Flüssen Mendoza und Jachal (Argentinien). Nach eigenen Reiseaufnahmen, nach Eisenbahn- und anderen Vermessungen entworfen von Dr. Richard Stappenbeck. 1:500,000 (1 in.=7.89 miles). (29°50′ - 33°3′ S.; 70°30′ - 68°5′ W.). 4 colors. Accompanies, as Taf. 53, paper with same title by same author, *Pet. Mitt.*, Vol. 57, I, pp. 293-297, 1911. [Valuable. Embodies results of original explorations.]

COLOMBIA-BRAZIL. Die Forschungsreise des Dr. Hamilton Rice im Flussgebiet des Rio Caiary-Uaupés. 1:1,000,000 (1 in.=15.78 miles). (3° - 0°55′ N.; 72°50′ - 71°15′ W.). 2 colors. With inset, 1:7,500,000, showing general location. Accompanies, as Taf. 54, notice with same title by T. Koch-Grünberg, *Pet. Mitt.*, Vol. 57, I, pp. 297-298, 1911.

AFRICA

AFRICA. [Three maps of Africa showing:] I (a) Der papillote äthiopische Bogen und sein Einflussgebiet; (b) Der traverse erythräische Bogen und sein Einflussgebiet. II Der escharpe Bogen (äquatorial oder vormalaiisch). III Der frontale Bogen und sein Einflussgebiet. [1:40,000,000 (1 in.=631.31 miles).] 3 colors. Accompany "Kulturtypen aus dem Westsudan" by Leo Frobenius, *Pet. Mitt., Erghft.* No. 166, 1910. [Show the territory in which various types of bows are in usage.]

AFRICA. (a) Isotherms for Africa. January. (b) Isotherms for Africa. July. Both maps 1:36,000,000 (1 in.=568.17 miles). Black. Accompany "Isotherms for Africa," by J. I. Craig, *Cairo Scient. Journ.*, Vol. 5, pp. 124-125, 1911. [Interval 2° C. Based on Survey Dept. observations, Buchan-Herbertson's Atlas of Meteorology and on Hann. English edition of the plates to be used in Arabic school atlas under preparation by Survey Dept. of Egypt.]

ALGERIA-MOROCCO. Zones Pacifiées de 1903 à 1910 [on Algerian-Moroccan frontier]. [1:5,000,000 approx. (1 in.=78.9 miles approx.). Scale incorrectly given on the original.] (36°20′ - 30°0′ N.; 5°0′ W. - 0°10′ E.). Black. Accompanies, as Fig. 68 on p. 356, review of A. Bernard's "Les confins algéro-marocains," by J. Brunhes, *La Géogr.*, Vol. 23, pp. 357-368, 1911.

ALGERIA-TUNIS. (a) Algérie-Tunisie-200,000^{e}. État d'avancement des travaux au 31 Décembre 1909. Tableau d'Assemblage des Cartes d'Algérie et de Tunisie au 50,000^{e} et au 200,000^{e}. 4 symbols in colors. (b) Carte de Tunisie au 100,000^{e}. État d'avancement des travaux au 31 Décembre 1909. 3 symbols in colors. Both maps 1:3,160,000 approx. (1 in.=49.9 miles approx.). Taf. 57

and 58, *Pet. Mitt.*, Vol. 57, I, 1911. [Index maps. Originally published as Pls. XI and XII of report of Service Géogr. de l'Armée for 1909. Cf. also note in *Bull.*, Vol. 43, p. 547 (July, 1911).]

BRITISH EAST AFRICA. East Africa Protectorate. [Sheet] Malindi and Surrounding Country. [Map of] Africa. 1:62,500. (1 in.=0.99 mile.) (3°0′-3°22½′ S.; 40°0′-40°12½′ E.). 3 colors. Geographical Section, General Staff, No. 2546. Surveyed under the direction of the Director of Surveys, East Africa Protectorate, in 1909. Printed at the War Office, March, 1911. Price 1s. 6d. [Relief in approximate contours in brown, interval 50 ft.; drainage in blue, vegetation in green. Similar in type to the map of the East Africa Protectorate, 1:125,000, listed in the *Bull.*, Vol. 43, p. 471 (June, 1911).]

CAPE OF GOOD HOPE AND BECHUANALAND PROTECTORATE. Kärtchen der Eisbewegung zur Dwyka-Eiszeit am Oranje und Vaal. 1:6,000,000 (1 in.=94.68 miles). (26⅔°-30½° S.; 21¾°-25¾° E.) Black. Accompanies note on "Paläozoische Eiszeitspuren in der Kapkolonie," *Ztschrft. für Gletscherkunde*, Vol. 5, p. 316, 1911. [Direction of glacial striæ, where observed, indicated by arrows.]

MOROCCO. Maroc au 500,000e. Réfection: État d'avancement des travaux au 31 Décembre 1909. [1:10,000,000 (1 in.=157.83 miles).] 3 symbols in colors. Taf. 59, *Pet. Mitt.*, Vol. 57, I, 1911. [Index map. Originally Pl. XVI, Report Service Géogr. de l'Armée for 1909. Cf. note under Algeria-Tunis.]

MOROCCO. La Frontière Orano-Marocaine Septentrionale. [1:1,000,000 approx. (1 in.=15.8 miles approx.).] (35°33′-34°13′ N.; 3°25′-2°15′ W.). Black. Reproduced from "Les Confins algéro-marocains," by A. Bernard in *L'Afrique Franç.*, Vol. 21, p. 209, 1911.

MOROCCO. Plan de la ville de Fez. [1:30,000 (1 in.=0.47 mile). D'après la Carte du Maroc de M. De Flotte (Levés du Cne. Larras). Black. Accompanies, on p. 409, note on Fez by J. S., *Rev. Franç. de l'Étrang. et des Colon.*, Vol. 36, pp. 406-412, 1911. Reproduced from *Bull. du Com. de l'Afr. Franç.*]

NYASALAND PROTECTORATE. Carte Géologique du Nyassaland par MM. A. R. P. Andrew et T. E. G. Bailey. 1:5,500,000 (1 in.=86.80 miles). (9°15′-17°15′ S.; 33°15′-36°0′ E.). Black. 6 symbols. Accompanies, as Fig. 72 on p. 381, note on "La Carte géologique du Nyassaland," by P. Lemoine, *La Géogr.*, Vol. 23, pp. 380-381, 1911. Reproduced by permission from paper by same authors, *Quart. Journ. Geol. Soc.*, London, Vol. 66, pp. 189-237, 1910.

SÃO THOMÉ AND PRINCIPE. (a) Carta da Ilha de S. Thomé. 1:150,000 (1 in.=2.36 miles). (0°27′ N.-0°6′ S.; 6°23′-6°47′ E.) With inset "Cidade de S. Thomé," 1:25,000 (1 in.=0.39 mile), and view of island of St. Thomé. Black. Commissão de Cartographia [Lisbon] 1902. (b) Carta da Ilha do Principe com a divisão das principaes exploraçoes agricolas. 1909. [1:85,000 aprrox. (1 in.=1⅓ mile approx.).]. (1°45′-1°30′ N.; 7°20′-7°30′ E.) With view of Island of Principe. 6 colors. Accompany "Manual Labour in S. Thomé and Principe" by Francis Mantero, translated from the Portuguese, Lisbon, 1910. [Map (a) a copy of that issued by the Portuguese Admiralty. Relief in hachures. Map (b) shows the boundaries of land concessions.]

ASIA

ASIA MINOR. Geologische Karte des Westlichen Kleinasien, Blatt 1, von Alfred Philippson. 1:300,000 (1 in.=4.73 miles). (40°31′-39°0′ N.; 35°50′-28°10′ E.) 25 colors. Accompanies "Reisen und Forschungen im Westlichen Kleinasien, I. Heft," by Dr. Alfred Philippson, *Pet. Mitt., Erghft.* No. 167, 1910. [Geology superimposed on the corresponding sheet of Philippson's topographic map of western Asia Minor referred to in the July *Bull.*, p. 548. 24 geological subdivisions are shown.]

CHINA. Itinéraires du Capitaine Harfeld dans le Hou Nann et le Kiang Si en 1903 et 1904. [1:1,300,000 approx. (1 in.=20½ miles approx.).]. (29°51′-27°30′ N.; 110°-114⅓° E.) Black. With inset "De Liou Linn Tza au Mines d'Or de Yu Kâ Tsonn et de Hou Lou Wann, 1:50,000" (1 in.=0.79 mile). Accompanies, facing p. 182, "Contribution à la Géographie du Hou Nann," by F. Harfeld, *Compte Rendu*, IXème Congr. Intern. de Géogr., Tome III, pp. 181-205, Geneva, 1911.

CHINA. Sketch Map Showing the Position of Lake Shang-ie. 1:5,000,000 (1 in.=78.91 miles). (35° N. and 103¼° E.) With inset, 1:40,000,000, showing location of main map. Black. Accompanies note on "A Mountain Lake in Kansu," *Geogr. Journ.*, Vol. 37, p. 661, 1911.

INDIA. Sketch to illustrate a journey into the Abor Country, N. E. frontier of India, by Col. D. M. Lumsden and Noel Williamson, 1909. 1:400,000 (1 in.= 6.31 miles). (28°30′ - 28°0′ N.; 94°56′ - 95°25′ E.) With inset, 1:18,000,000, showing the location of main map. Black. Accompanies on p. 623, paper with similar title by same authors, *Geogr. Journ.*, Vol. 37, pp. 621-629, 1911.

JAPAN. Geological Map of Japanese Empire. 1:2,000,000 (1 in.=31.56 miles). (48° - 29° N.; 123° - 149° E.) 22 colors. With insets: (a) General Map of Japanese Empire, 1:12,000,000 (1 in.=189.39 miles), showing extent of political dominions; (b) 5 insets, 1:4,000,000 (1 in.=63.12 miles), of (1) southern half of Karafuto (Sakhalin Island), (2) Chishima (Kurile Islands), (3) Kwantōshu (Port Arthur Peninsula) and Neutral Territory, (4) Taiwan (Formosa) and Ryūkyū Islands, (5) Ogasawara-Jima (Bonin Islands). Imperial Geological Survey of Japan. Kinosuku Inouye, Director. Geologists: D. Sato, T. Iki, D. Yamashita, E. Sagawa, Y. Otsuki, J. Ohikata, S. Noda, S. Kōzu, S. Nakamura. 4 sheets. Lith. Y. Koshiba, Tokyo. Feb. 1911. Nomenclature in Japanese and in English. Accompanied by a summary of the "Geology of the Japanese Empire and the Corean Peninsula," 4 pp., in English and in Japanese. [A fundamental general geologic map of Japan based on the standard 15-sheet "Geological Map of the Japanese Empire on the Scale of 1:1,000,000. Compiled by the Imperial Geological Survey of Japan, 1902." Its differentiation of igneous rocks, notwithtsanding the smaller scale, is more detailed than that of the earlier map, which distinguishes between four groups, while the present map lists ten kinds of igneous rocks. The geological coloring distinguishes between Gneiss, Crystalline Schist, Paleozoic, Mesozoic [undifferentiated], Triassic, Jurassic, Cretaceous, Tertiary, Diluvium, Alluvium, Raised Coral Reef; Granite, Porphyry, Diorite, Gabbro, Periditite, Serpentine, etc. [one color for the last three], Diabase, Porphyrite, Liparite, Andesite, Basalt, Volcanic Ash and Mud Lava. Due to the expansion of the Japanese Empire since the Russo-Japanese War the geologic coloring has been extended to include Corea, the Liao-tung Peninsula and the southern half of Sakhalin.]

JAPAN. (a) Map Showing the Distribution of Several Types of the Copper Deposits in Japan. 1:10,000,000 (1 in.=157.83 miles). (46° - 30° N.; 125° - 147° E.). 4 colors. (b) Map Showing the Distributions of Principal Coal and Oil Fields in Japan. 1:20,000,000 (1 in.=315.66 miles). (50° - 20° N.; 120° - 147° E.). Black. (c) [Map Showing the Distribution of] Some Important Mines in Japan. 1:5,000,000 (1 in.=78.91 miles). (47° - 30° N.; 128° - 148° E.). With insets of S. Sakhalin, Kurile and the Ryu-kuy Islds. and of the Chikuhō Coal Field (the latter 1:500,000 [1 in.=7.89 miles]). 1 color. Accompany, as Pls. I, II and III, facing pp. 72, 116 and 144, "Mining in Japan: Past and Present," Bureau of Mines, Dept. of Agric. and Comm. of Japan. 1909.

PALESTINE. Karte des Ostjordanlandes [in 12 Blatt] aufgenommen von Dr. G. Schumacher, herausgeg. vom Deutschen Verein zur Erforschung Palästinas. 1:63,360 (1 in.= 1 mile). Blatt A5 (32°25′ - 32°5.5′ N.; 35°30′ - 35°52′ E.). Blatt B5 (32°25.0′ - 32°5.5′ N.; 35°52′ - 36°14′ E.). 5 colors. [Relief in gray-brown shading, periodic streams in brown, permanent ones in blue. A valuable detailed map. Sheets A5 and B5 comprise the region east of the Jordan and N. of the Wadi Serka.]

SUMATRA. Das südliche Sumatra mit dem Wohngebiet der Kubus im zentralen Urwald. 1:3,000,000 (1 in.=47.34 miles). (1° - 6° S.; 100° - 106° E.). Black. Accompanies paper on "Die Religionslosigkeit der Kubus auf Sumatra," by W. Volz, *Pet. Mitt.*, Vol. 57, I, pp. 288-292, 1911.

TURKEY-PERSIA. Die Tektonische Bedingtheit der Kurdensitze. 1:10,000,000 (1 in.=157.83 miles). (42° - 33° N.; 35°50° E.). Black. Accompanies, on p. 287, paper on "Kurdistan—ein länderkundlicher Begriff?" by E. Banse, *Pet. Mitt.*, Vol. 57, I, pp. 286-288, 1911.

AUSTRALASIA AND OCEANIA

DUTCH NEW GUINEA. Map to illustrate the expedition of H. A. Lorentz, LL.D., in Dutch New Guinea. 1907-09. 1:400,000, or 1 in.=6.31 miles. Accompanies paper by same author on "An Expedition to the Snow Mountains of New Guinea," *Scott. Geogr. Mag.*, Vol. 27, pp. 237-359, 1911. Published by permission of Royal Geogr. Soc. [Same map as that listed in *Bull.*, Vol. 43, p. 472.]

EUROPE

AUSTRIA. Waldgrenzkarte der Österreichischen Alpen von Dr. Richard Marek. 1:1,000,000 (1 in.=15.78 miles). 2 colors. Accompanies "Waldgrenzstudien in den Österreichischen Alpen" by Dr. R. Marek, *Pet. Mitt., Erghft.* No. 168, 1910. [Area represented bounded on the N., W. and S. by the political boundary of Austria and on the N., E. and S. E. by the physical boundary of the eastern Alps. Situation is shown by means of the drainage system. The tree lines of equal altitude are shown in green, with an interval of 100 meters. The legend unfortunately gives rise to confusion as it incorrectly designates these lines as 'Isohyeten' instead of 'Isohylen,' as correctly used in the text. Numerals in black indicate the average number of days on which precipitation occurred during the growing season in the period from 1898 to 1902.]

BALKAN PENINSULA. (a) Les Lacs Égéen et Pannonien au Miocène dans la Péninsule Balkanique. 1:3,000,000 (1 in.=47.34 miles). 45½° - 38⅚° N.; 19½° - 25° E.) Black. (b) Carte du Lac Égéen par J. Cvijič. 1:75,000 (1 in.=11.84 miles). (41°30′ - 40°30′ N.; 20°35′ - 23°50′ E.) 3 colors. Accompany, as Pls. 16 and 17, paper on "L'Ancien Lac Égéen," by J. Cvijič, *Ann. de Géogr.*, Vol. 20, pp. 233-259, 1911. [Map (b) distinguishes between prelacustrine valleys, two groups of terraces belonging to "Lac Égéen" and two to the isolated lake basins. Shows maximum extent of "Lac Égéen" and extent of present lakes. Symbols for gravel, lacustrine deposits, faults.]

CENTRAL EUROPE. Das Mitteleuropäische Eisenbahnnetz beim Ausbruch des deutsch-französischen Krieges. 1:3,500,000 (1 in.=55 24 miles). (56° - 45° N.; 2° - 22° E.). 6 colors. Accompanies, as Taf. 60, paper on "Das Deutsche Eisenbahnnetz 1870 und 1911 in militärgeographischer Hinsicht" by Ferrarius, *Pet. Mitt.*, Vol. 57, I, pp. 323-325, 1911. [Copy of sheet from Stielers Hand Atlas, edition of 1870.]

FRANCE. (a) Carte tectonique de la région charentaise. (b) Les différents cycles d'érosion dans la région de la Charente. Both maps: 1:1,000,000 (1 in.= 15.78 miles). (46°20′ - 45°20′ N.; 1°30′ W. - 1°10′ E.) Black. Accompany, as Figs. 1 and 2, on pp. 215 and 217, paper on "Les Origines de la Vallée de la Charente," by C. Passerat, *Ann. de Géogr.*, Vol. 20, pp. 213-232, 1911. [On map (a) distinction made between crystallines of the Massif Central, Jurassic limestones of intermediate regions and Cretaceous limestones of coast. Faults, anticlines and synclines shown. On map (b) symbols distinguish between the residual areas of the first cycle, the platforms of the second and third cycles, the valleys of the fourth cycle and the alluvial deposits of the first three cycles.]

GERMANY. Geologisch-morphologische Übersichtskarte der Ueckermünder Heide. Auf Grund der K. Keilhackschen Karten und eigener Untersuchungen gezeichnet von H. Seelheim. 1:250,000 (1 in.=3.95 miles). (55°52′ - 53°27′ N.; 13°42′ - 14°40′ E.). Black. Accompanies "Die Ueckermünder Heide" by H Seelheim, XII. *Jahresb. Geogr. Gesell. Greifswald* 1909-1910, pp. 73-193, 1911.

GERMANY. Die Sturmflut vom 30./31. Dezember 1904 an der Küste Pommerns von der Swine bis zum Darss. Entworfen von Dr. G. Krüger. 1:300,000 (1 in.=4.73 miles). (54°45′ - 53°53′ N.; 12°20′ - 14°20′ E.). Black. Accompanies paper "Über Sturmfluten an den deutschen Küsten der westlichen Ostsee etc" by G. Krüger, XII. *Jahresb. Geogr. Gesell. Greifswald* 1909-1910, pp. 195-294, 1911.

GERMANY. (a) Volksdichtekarte von Neu-Vorpommern und der Insel Rügen bearbeitet von Dr. E. Müller. 10 symbols in colors. (b) Grösse und Lage der Wohnplätze von Neu-Vorpommern und der Insel Rügen bearbeitet von Dr. E. Müller. 1 color. Both maps 1:200,000 (1 in.=3.16 miles). (54°42′ - 53°50′ N.;

12°25′ - 13°55′ E.). Accompany, as Taf. 1 and 2, "Beiträge zur Siedelungskunde Neu-Vorpommerns unter der Insel Rügen" by R. E. Müller. XII. *Jahresb. Geog. Gesell. Greifswald* 1909-1910, pp. 385-486, 1911. [Ten densities indicated on map (a); 13 sizes of towns on map (b).]

GERMANY. (a) Isochronenkarte des Gesamtverkehrs für Mitteldeutschland mit dem Ausgangspunkt Leipzig. Gezeichnet von J. Riedel. 1:1,500,000 (1 in.=23.67 miles). (53¾° - 48¾° N.; 8½° - 17° E.). 4 colors. (b) Isochronenkarte des Gesamtverkehrs für die weitere Umgebung von Leipzig. 1:500,000 (1 in.=7.89 miles). (51°55′ - 51°0′ N.; 11°30′ - 13°20′ E.). 10 colors. Accompany, as Taf. 51 and 52, paper on "Neue Studien über Isochronenkarten" by J. Riedel, *Pet. Mitt.*, Vol. 57, I, pp. 281-284, 1911. [Map (a) shows 3, map (b) 10 zones of distance in time from Leipzig, based on timetables for the summer of 1909.]

ICELAND. (a) Übersichtskarte der Gletschergebiete von Island von Hans Reck, nach einer Karte von Th. Thoroddsen. 1:3,000,000 (1 in.=47.34 miles). (66⅔° - 63½° N.; 24½° - 13½° W.) Black. (b) Kartenskizze der Umgebung des Tungnafells-Jökulls. 1:150,000 (1 in.=2.36 miles). (64°35′ N. - 18°20′ W.) Black. Accompany, on pp. 249 and 287, respectively, "Glazialgeologische Studien über die rezenten und diluvialen Gletschergebiete Islands," by H. Reck, *Ztschrft. für Gletscherkunde*, Vol. 5, pp. 241-297, 1911.

THE NETHERLANDS. (a) Historische Karte von Zeeland nach Utrecht Dresselhuis. (b) Das heutige Zeeland nach Kuijper. Both maps: Besondere Bearbeitung des Verfassers. 1:230,000 (1 in.=5.21 miles). (51°46′ - 51°12′ N.; 3°18′ - 4°29′ E.). Black. Accompany paper "Zur Geschichte und Natur der Schelde-Mündungen in der Niederländischen Provinz Zeeland" by F. Müller, *Ztschrft. Gesell. Erdk.*, Berlin, pp. 365-400, 1911.

RUSSIA. Die Schiffahrtswege Russlands. 1:10,000,000 (1 in.=157.83 miles). (62½° - 38° N.; 15° - 70° E.). 4 colors. Accompanies "Russiche Grosschiffahrtswege" by R. Hennig, *Deutsche Rundsch. für Geog.*, Vol. 33, pp. 432-439, 1911. [Indicates navigable rivers; rivers having steam navigation; projected trunk waterways.]

SWEDEN. Geological Map of the Pre-Quaternary Systems of Sweden prepared and published by the Geological Survey of Sweden through A. E. Törnebohm. 2nd Edit. 1910. 2 Sheets. Scale 1:1,500,000 (1 in.=23.67 miles). (69° - 55 N.; 25° - 39° E.). 47 colors. Accompanied by "Explanatory Remarks to Accompany the Geological General Map, etc.," *Sverig. Geol. Undersökning.* Series Ba, No. 6, 52 pp. [The second edition of this standard general geologic map of Sweden, first published in 1901.]

SWEDEN. Karte öfver Mellersta Sveriges Landformer af Sten De Geer. 1:500,000 (1 in.=7.89 miles). 59°40′ - 57°15′ N.; 11°7′ - 18°18′ E.). 11 colors. With two geologic sections. Accompanied by "Explanation of Map of Land-Forms in the Surroundings of the Great Swedish Lakes" by Sten De Geer. *Sverig. Geol. Undersökning*, Series Ba, No. 7, 30 pp. [Important geo-morphologic map of Central Sweden. Distinguishes between escarpments of four altitudes, plateaus, depressions and plains. Indicate faults. Isobaths shown, interval 20 m.]

SWEDEN. Das Spätglaciale Süd-Schweden. Übersichtskarte mit Osen, Endmoränen und Schrammen von der Schwedischen Geologischen Landesanstalt ausgegeben durch Gerard De Geer, 1910. 1:500,000 (1 in.=7.89 miles). 60°4′ - 55°50′ N.; 11°8′ - 19°27′ E.). 3 colors. *Sverig. Geol. Undersökning*, Ser. Ba, No. 8. [Indicates late pleistocene territory in buff. Symbols for glacial striæ, terminal moraines, districts of morainic topography, eskers.]

TURKEY. Kirjali [Sheet]. [Map of] Turkey 1:250,000 (3.95 miles to an inch). (42°15′ - 41°25′ N.; 24°20′ - 26°0′ E.). 5 colors. Geographical Section, General Staff, No. 2097, based on the General Staff maps of Austria, 1903, and Turkey, 1898. Drawn at the War Office and photo-etched at the Ordnance Survey, Southampton, 1910. Printed at the War Office, 1910. Price 2/6. [Relief in approximate contours in brown, interval 250 ft., above 2,000 ft., interval 500 ft. Drainage in blue; forests in green; special symbols for vineyards.

Distinguishes between four kinds of roads. Gives translation of 50 Turkish geographic terms. This map is a sheet of the map of Turkey in Europe, Eastern and Central, in 10 sheets, listed in *Bull.*, Vol. 43, p. 312 (April, 1911).]

POLAR

ARCTIC. The [North] Polar Regions Showing the Routes and Explorations of Robert E. Peary, U. S. N., from 1892-1906. [1:10,000,000 approx. (1 in.=158 miles approx.).] Black. Accompanies, facing p. 238, paper on "History and Field Work of the Peary Arctic Club," by H. L. Bridgman, *Compte Rendu*, IXème Congr. Intern. de Géogr., Tome III, pp. 228-241. Geneva, 1911. [Photograph of a map previously published. Shows routes of Peary's expeditions of 1892, 1893-95, 1898, 1902, 1906 (course of the *Roosevelt* and sledge journey).]

ANTARCTIC. (1) [Three maps of the adjoining parts of the Ross and Weddell Quadrants, 1:18,500,000 approx. (1 in.=292 miles approx.), (50° - 75° S.; 120° - 50° W.), entitled:] (a) Croquis Bathymétrique d'après les Observation de la *Belgica* et du *Pourquoi-Pas?* (b) Carte des Températures de l'Eau de Mer en Décembre et Janvier. (c) Carte des Densités de l'Eau de Mer en Décembre et Janvier. [Map (a) shows 500, 1,000, 2,000, 3,000, 4,000, and 5,000 meter isobaths. Map (b) shows isotherms of 1° interval and limit of ice-pack. Map (c) shows lines of equal density with interval of 0.00025. (2) Carte Bathymétrique Côtière [of West Antarctica from South Shetland Islands to Terre Charcot]. [1:5,000,000 approx. (1 in.=79 miles approx.).] (61° - 70° S.; 78° - 53 W.) Black. Accompany, as Figs. 1, 2, 4 and separate plate, "Principaux Résultats d'Océanographie physique, Expédition Antarctique du Docteur Charcot à bord du *Pourquoi Pas?* (1908 1910)," by J. Rouch, *Bull. de l'Inst. Océanogr.* No. 206, Monaco, April, 1911.

ANTARCTIC. (a) South Polar Regions. With the Antarctic Continent drawn to illustrate the probable topography as deduced from present available data by D. Mawson. 1:40,000,000 (1 in.=631.30 miles). (South of about 40° S.) 8 colors. (b) Supposed Antarctic Continent. Alternative configuration to that shown on the [previous] general map. 1:50,000,000 (1 in.=789.13 miles). (South of about 50° S.) Black. Accompany, as separate plate and as text-map, respectively, the latter on p. 613, paper on "The Australasian Antarctic Expedition," by Dr. D. Mawson, *Geogr. Journ.*, Vol. 37, pp. 609-620, 1911. [Map (a) delineates Antarctic Andes as continuous from Graham Land to South Victoria Land. Map (b) suggests as possible a depression between the margin of the Antarctic Plateau, considered as extending from Coats Land to South Victoria Land, and the Antarctic Andes, considered as joining Graham Land to King Edward VII Land. Map (a) shows ocean depths in six tints.]

GREENLAND. Carte Indiquant la Position de l'Isthme unissant l'Ile Clavering au Continent (Côte Orientale du Grönland). No scale given. 1:2,500,000 approx. (1 in.=39.5 miles approx.).] (74¼° N. and 21° E.). Black. Accompanies, as Fig. 73 on p. 384, note on "Changement récent survenu sur la côte orientale du Grönland" by C. Rabot, *La Géogr.*, Vol. 23, pp. 383-384, 1911. Reproduced by permission from *Geogr. Tidskr.*, Vol. 11, p. 25, 1911.

EDUCATIONAL

GOODE'S BASE MAPS. A series of outline maps for all classes of work in applied sciences and the various fields of research. Prepared by J. Paul Goode, Assoc. Prof. of Geogr., Univ. of Chicago. The University of Chicago Press, Chicago, Ill. The series consists of: No. 1. The World: Mercator projection. 2. North America. 3. South America. 4. Europe. 5. Asia. 6. Africa. 7. Australasia. 9. America (U. S.) 10. America (U. S.; state outlines only). 14. The British Isles. 15. Western and Southern Europe. 17. France. 18. The Spanish Peninsula. 19. Italy. 20. Central Europe. 21. The German Empire. 24. The Levant. 32. America (U. S.) by counties. In two sizes: 8 x 10½ inches, one cent each; 15 x 10½ inches, three cents each; except No. 32, which is issued 15 x 10½ inches at 3 cents each, and 21 x 15 inches at five cents each. Accompanied by circular of 4 pp.

A series of outline maps, of convenient size and arrangement to insert in note-books, intended to serve as bases for the delineation of various phenomena in class work in geography, history, civics, economics, etc. They show the chief drainage features and mountains, political boundaries and the location of large towns, without nomenclature. In execution the line element is neat. Relief is not so successfully rendered and in some instances, particularly on Maps Nos. 2, 3 and 24, has hardly emancipated itself from the "caterpillar" method of treatment. To avoid the difficulty of the hachure method resort is had on some maps (14, 17) to a single contour for the expression of relief. The graticule is drawn in full only on the ocean surfaces, nominally to avoid overcharging the land surfaces because of their being the areas mainly coming into consideration in the delineation of various phenomena. Such a course is at least open to criticism as, precisely for this reason, guide lines are far more necessary on the land than on the water surfaces—a requirement which the indication of the intersection of the parallels and meridians on the land surfaces of these maps does not sufficiently meet.

The map of the United States showing county boundaries, is of value for statistical purposes, although on the 15 x 10½ inch edition the names are so small as to be hardly legible.

Such matters as the careless lettering of the degrees on Maps 9, 10, 20 and 24; the somewhat unusual designation of the United States as America on Maps 9, 10 and 32, although the latter term is followed by the former in parentheses; the fact that equivalency is ascribed to the polyconic projection, as is done in the circular with reference to Map 2; the absence of a map-net on the county maps of the United States, although referred to in the circular as drawn on the polyconic projection—all speak of a lack of unity of purpose and method regrettable in an educational publication. Nor does such self-laudatory comment as that contained in the accompanying circular to the effect that "From every point of view they [these base maps] are the finest issued in the country" recommend itself to one's favor. It seems rather unusual over the imprint of the University of Chicago Press.

GEOGRAPHISCHER VOLKSSCHUL-ATLAS FÜR VIER- BISSECHSKLASSIGE VOLKSSCHULEN. Ausgabe für Nieder-Österreich mit Ergänzung für Wien. Bearbeitet von Joh. Geog. Rothaug. 17 plates. G. Freytag & Berndt, Wien. K. 2.22. 13½ x 9½ inches. [An atlas for Austrian grammar schools. Special edition for the Province of Lower Austria, of which one special map is given, and for Vienna, of which four maps are given. Physical coloring is the basis for the general maps. Although not equal to the best German school atlases of the same type, this atlas is very creditable.]

ATLASES

DENMARK. Danmark i 35 Kort med 3 Kort over Nordslesvig. Med fortegnelse over alle Danske Køgstaeder, Byer, Landsbyer, Stationer og Gaarde, samt Afstandene mellem alle de vigtigste Byer og Angivelse af Sevaerdigheder. "Politiken" 's Forlag, Copenhagen, 1910. [A handy pocket-atlas of Denmark and northern Schleswig published by one of the leading newspapers of Copenhagen. 34 plates, on the scale of 1:240,000 (3.79 miles to an inch), are devoted to Denmark and 3, on the scale of 1:300,000 (1 in.=4.73 miles), to northern Schleswig, which politically belongs to Germany, but linguistically to Denmark. An index map facilitates finding the relative position of each plate. The maps show no relief, but distinguish between woods, meadows, marshes, sand-dunes and tidal flats. Railroads, roads and steamship lines are shown. An index of place names is printed on the reverse of the maps and refers to the numbered squares into which the plates are divided. Very fair in execution.]

GENERAL

WORLD. Verbreitung der Bananenkultur. Entworfen von Dr. Richard Rung. [Mercator projection: equatorial scale 1:100,000,000.] 2 colors. Accompanies "Die Bananenkultur," by Dr. R. Rung, *Pet. Mitt., Erghft.* No. 169, 1911. [Distinguishes between an inner and an outer zone of banana cultivation.]

CURRENT GEOGRAPHICAL PAPERS

NORTH AMERICA

United States

ALLEN, GEO. M. The Irrigated Lands of the State of Washington, Bur. of Stat. and Imm., State of Washington. 1910. 96 pp. Ills. and Map. Olympia, Washington.

BASTIN, EDSON S. Geology of the Pegmatites and Associated Rocks of Maine, including Feldspar, Quartz, Mica, and Gem Deposits. *Bull.* 445, U. S. Geol. Surv., 1911, 152 pp., Map in Pocket, Diagrams and Ills.

BOWNOCKER, J. A. Mineral Resources of Ohio. *Jour. of Geogr.*, Vol. IX, No. 7, 1911, pp. 175-179, Madison, Wis.

BRETZ, J. HARLEN. The Terminal Moraine of the Puget Sound Glacier. Map. *Journ. of Geol.*, Vol. XIX, No. 2, 1911, pp. 161-174, Chicago.

CAMPBELL, M. R. Coal in San Benito County, California. *Bull.* 431, Contr. to Econ. Geol., 1909, U. S. Geol. Surv., pp. 243-247, Washington, 1911.

CAPPS, STEPHEN R. The Underground Waters of North-Central Indiana. With a chapter on the Chemical Character of the Waters, by R. B. Dole. *Water-Supply Paper 254*, U. S. Geol. Surv., Washington, 1910, 279 pp., maps, diagrams, and illustrations.

CLAPP, E. J. Rhine and Mississippi River Terminals. *Yale Rev.*, Vol. XIX, No. 4, 1911, pp. 393-397, New Haven, Conn.

DURSTINE, W. E. Lake Erie and Its Southern Ports. *Jour. of Geogr.*, Vol. IX, No. 7, 1911, pp. 183-186, Madison, Wis.

FENNEMAN, N. M. Geographic Influences Affecting Early Cincinnati. *Journ. of Geogr.*, Vol. IX, No. 7, 1911, p. 192.

GRANT, MADISON. Conditions of Wild Life in Alaska. Ill. Ann. Report, Board of Regents, Smiths. Inst., 1909, pp. 521-529, Washington.

KINDLE, E. M. The Southerly Extension of the Onondaga Sea in the Allegheny Region. *Journ. of Geol.*, Vol. XIX, No. 2, 1911, pp. 97-103, Chicago.

KÜMMEL, HENRY B. Notes on the Mineral Industry. Part 3, Ann. Report State Geol., Geol. Surv. of New Jersey, 1910, pp. 103-123, Trenton, N. J.

MARTIN, LAWRENCE. Alaskan Earthquakes of 1899. Maps. *Bull.* Geol. Soc. of Amer., Vol. 21, No. 3, 1910, pp. 339-406, Washington.

MOYER, L. R. The Prairie Flora of Southwestern Minnesota. *Bull.* Minn. Acad. of Sci., Vol. IV, No. 3, 1910, pp. 357-372.

NEWELL, F. H. Reclamation of the Arid West. *Science.* Vol. XXXIII, No. 853, 1911, pp. 681-684.

NEWLAND, D. H. Gypsum Deposits of New York. *Museum Bull.* 143, New York State Museum, 1910, 94 pp., Maps and Ills., Albany.

OLIVER, MARION L. The Snake Dance. Ills. *Nat. Geogr. Mag.*, Vol. XXII, No. 2, 1911, pp. 107-137.

PARKER, ARTHUR S. Iroquois Uses of Maize and other Food Plants. *Bull.* 144, New York State Museum. 1910, 119 pp., and Ills., Albany.

ROTHPLETZ, A. Uber die Ursachen des Kalifornischen Erdbebens von 1906. *Sitzungsb.* K. Bayerischen Akad. Wiss., Math.-phys. Klasse, Jahrg. 1910, 8 Abhandl., 32 pp., Map and Diagrams, Munich.

SHAW, G. W. How to Increase the Yield of Wheat in California. *Bull.* No. 211, 1911, College of Agric., Univ. of Cal. Publs., 314 pp. and Ills., Berkeley, Cal.

SHAW, EUGENE WESLEY. High Terraces and Abandoned Valleys in Western Pennsylvania. Map and Diagrams. *Journ. of Geol.*, Vol. XIX, No. 2, 1911, pp. 140-156, Chicago.

SHERMAN, SIMON AUGUSTUS. Lumber Rafting on Wisconsin River. Map. *Proc.* State Hist. Soc. of Wis., Fifty-Eighth Ann. Meeting, 1910, pp. 171 180, Madison. Wis.

SPENCER, J. W. Relationship of Niagara River to the Glacial Period. *Bull.* Geol. Soc. of Amer., Vol. 21, No. 3, 1910, pp. 433-440, Washington.

SPENCER, J. W. Relative Work of the Two Falls of Niagara. *Bull.* Geol. Soc. of Amer., Vol. 21, No. 3, 1910, pp. 441-446, Washington.

WALKER, T. B. Conservation of the Future Lumber Supply. *Bull.* Minnesota Acad. of Sci., Vol. IV, No. 3, 1910, pp. 347-356.

WASHBURNE, CHESTER W. Gas Prospects in Harney Valley, Oregon. *Bull.* 431, Contr. to Econ. Geol., 1909, U. S. Geol. Surv., pp. 56-57, Washington, 1911.

WINCHELL, N. H. Hennepin at the Falls of St. Anthony. *Bull.* Minnesota Acad. of Sci., Vol. IV, No. 3, 1910, pp. 380-384.

U. S. Geographic Board. Decisions, Jan. 4, 1911.

—— U. S. Geographic Board. Revision of Previous Decision. February 1, 1911.

—— Director's Biennial Report to the Governor of Oklahoma, 1910. *Bull.* No. 6, Oklahoma Geol. Surv., pp. 11-31, Norman, Okla.

—— Illinois State Geological Survey Bulletin, No. 16. Year-Book for 1909. 402 pp., Maps, Diagrams and Ills., Urbana, 1910.

Canada

CAMERON, MISS AGNES DEANS. From Winnipeg to the Arctic Ocean. Ills. *Journ.* Manchester Geogr. Soc., Vol. XXVI, Part II, 1910, pp. 97-101.

LALIBERTÉ, FÉLIX. Une Expédition dans l'Abitibi. *Bull.* Soc. Géogr. de Québec. Vol. 5, No. 1, 1911, pp. 43-50.

LE VASSEUR, N. Le chemin de fer de Matane et Gaspé, Ills. *Bull.* Soc. Géogr. de Québec, Vol. 5, No. 1, 1911, pp. 60-64.

—— The Colonisation of Western Canada. Ills. *Scott. Geogr. Mag.*, Vol. XXVIII, No. 4, 1911, pp. 196-200.

—— Geographic Board of Canada. Decisions, April, 1911. Extract from *The Canada Gazette*, May 6, 1911, pp. 3-6, Ottawa.

—— Summary Report of the Geological Survey Branch of the Department of Mines for the Calendar Year 1910. *Sess. Paper* No. 26, A. 1911, 314 pp., Maps and Index, Ottawa, 1911.

SOUTH AMERICA

Argentina

CAMPBELL, JUAN. Información descriptiva sobre la provincia de San Juan. *Bol.* Inst. Geogr. Argentino, Tomo XXIV, Núm. 1 á 12, pp. 51-66, Buenos Aires.

LÜTGENS, DR. RUDOLF. Beiträge zur Kenntnis des Quebrachogebietes in Argentinien und Paraguay. Maps and Ills. *Mitt.* Geogr. Gesellsch. in Hamburg, Bd. XXV, Heft 1, 1911, pp. 3-70.

Brazil

ALVES DOS SANTOS, ANTONIO. Navegação na costa do Rio Grande do Sul. *Revista Mar. Brazileira*, Anno XXX, No. 8, 1911, pp. 1385-1389, Rio de Janeiro.

AXERIO, EMILIO. Brasile. Lo Stato di Goyaz. *Boll.* del Minist. degli Affari Esteri, N. generale 405, N. di Serie 21, Gennaio, 1911, 18 pp., Rome.

BRANNER, J. C. The Minerals Associated with Diamonds and Carbonados in the State of Bahia, Brazil. *Amer. Journ. of Sci.*, Vol. XXXI, No. 186, 1911, pp. 480-490, New Haven, Conn.

Peru

LAVALLE Y GARCIA, J. A. The Cotton Production of Peru. Ills. *Peru To-Day*, Vol. III, No. 2, 1911, pp. 23-28, Lima.

LORENA, ANTONIO. Algunos materiales para la antropología del Cuzco. Ills. *Bol.* Soc. Geogr. de Lima, Tomo XXV, Trim. Segundo, 1909, pp. 164-173.

MELO, ROSENDO. La Navegación en el Perú, Tercera Parte-Navegación marítima mercantil. [to be continued]. Maps and Ills. *Bol.* Soc. Geogr. de Lima, Tomo XXIII, Trim. Segundo, 1908, pp. 121-185.

ROSELL, RICARDO GARCIA. La ciencia y los temblores. Reseña de las diversas teorías y algunos comentarios. Maps. Memoria Anual y Anexos, 1907. *Bol.* Soc. Geogr. de Lima. Tomo XXII, 1907, pp. 81-140.

SALINAS, FR. FRANCISCO CHEESMAN. Distrito de Lunahuaná Provincia de Cañete. Map and Plan. *Bol.* Soc. Geogr. de Lima, Tomo XXV, Trim. Segundo, 1909, pp. 240-243.

SCHLAGINTWEIT, DR. OTTO. Eine Bergfahrt im nördlichen Peru. Ills. *Deutsche Alpenz.* Zweites Maiheft, 1911, pp. 83-89.

SUTTON, C. W. The Irrigation of the Coast of Peru. Maps and Ills. *Peru To-Day*, Vol. III No. 3, 1911, pp. 25-55, Lima.

—— Informe que la Comisión del Observatorio Sismográfico presenta a la Sociedad Geográfica de Lima. Maps and Ills. Memoria Anual y Anexos, 1907. *Bol.* Soc. Geogr. de Lima, Tomo XXII, 1907, pp. 1-150.

—— Itinerario de los viajes de Raimondi en el Perú. *Bol.* Soc. Geogr. de Lima, Tomo XXV, Trim. Segundo, 1909, pp. 129-163, and Trim. Tercerto, 1910, pp. 249-288.

Venezuela

BENDRAT, T. A. Geologic and Petrographic Notes on the Region about Caicara, Venezuela. Map and Diagrams. *Journ.* of Geol., Vol. XIX, No. 3. 1911, pp. 238-248.

AFRICA

Algeria, Morocco and Tunis

FIDEL, CAMILLE. Les Intérêts Italiens en Tunisie. *Renseign. Col.*, Vingt et Unième Année, No. 5, 1911, pp. 124-134.

LEMOINE, PAUL. Les mines de plomb et de zinc en Algérie. Map. *La Géogr.*, Vol. XXIII, No. 4, 1911, pp. 263-269.

RENÉ-LECLERC, CH. La situation économique de Tétouan. Map. *Renseign. Col.*, Vingt et Unième Année, No. 4, 1911, pp. 90-96.

—— Le Tafilelt. D'après René Caillié. Maps. *Renseign. Col.*, Vingt et Unième Année, No. 3, 1911, pp. 63-80.

Anglo-Egyptian Sudan

BRIDGMAN, HERBERT L. The Sudan To-day and To-morrow. *Journ. of* Race Development, April, 1911, pp. 433-446, Worcester, Mass.

CROWFOOT, J. W. Some Red Sea Ports in the Anglo-Egyptian Sudan. Map and Ills. *Geogr. Journ.*, Vol. XXXVII, No. 5, 1911, pp. 523-550.

Belgian Congo

FERGUSON, REV. W. L. The Present Situation in the Congo. *Journ.* of Race Development, April, 1911, pp. 400-414, Worcester, Mass.

MARTIN, CAMILLE. La navigation sur le Congo et le Stanley Pool. *L'Afrique Franç.*, Vingt et Unième Année, No. 5, 1911, pp. 188-189.

WILVERTH, CAPITAINE. Pêche et Poissons au Congo Belge. Ills. *Bull.* Soc. Belge d'Études Col., Dix-Huitième Année, No. 4, 1911, pp. 251-268, Brussels.

—— La navigabilité du Kasai-Sankuru. Map. *Mouve. Géogr.*, 28e Année, No. 10, 1911, Cols. 121-125.

—— La Pipe Line du Congo. *Mouve. Geogr.*, 28e Année, No. 17, 1911, cols. 212-215.

Cape Colony

—— Fourteenth Annual Report of the Geological Commission. 1909. Dep. of Agric., Cape of Good Hope. 1919, 116 pp., Index, Profiles and Diagrams, Cape Town.

Equatorial Africa

WAUTERS. A. J. Le Transafricain de Matadi à Dar-Es-Salam. Map. *Mouve. Géogr.*, 28e Année, No. 13, 1911, Cols. 157-161.

French West Africa

ARCIN, ANDRÉ. Le Chemin de fer de la Guinée française. *Bull.* Soc. Géogr Comm. de Bordeaux, 37e Année, No. 5. 1911, pp. 97-102, and No. 6, pp. 125-132.

DELAFOSSE, MAURICE. Les Confréries Musulmanes et le Maraboutisme dans les pays de Sénégal et du Niger. *Renseign. Col.*, Vingt et Unième Année, No. 4, 1911, pp. 81-90.

GRUVEL, A. Les pecheries de la Côte d'Ivoire. *Bull.* Soc. Geogr. Comm. de Bordeaux, 37e Année, No. 2, 1911, pp. 36-38.

HUBERT, HENRY. Populations géophages de l'Afrique Occidentale. *Renseign. Col.*, Vingt et Unième Année, No. 3, 1911, pp. 59-61.

HUBERT, HENRY. Le relief de la Boucle du Niger. Maps and Ills. *Annal. de Géogr.*, XXe Année, No. 110, 1911, pp. 155-178.

TERRIER, AUGUSTE. L'Essor de l'Afrique Occidentale Française. Ills. *L'Afrique Franç.*, Vingt et Unième Année, No. 5, 1911, pp. 161-164.

—— Statistiques du Commerce des Colonies Françaises pour l'Année 1908. Tome II: Statistiques générales de l'Afrique occidentale française. Ministère des Colonies, 1910, pp. 12-34, Paris.

—— Statistiques de l'Industrie Minière dans les colonies françaises pendant l'Année 1908. Afrique Occidentale, Tableau général de l'industrie minière de 1900 à 1908, p. 8, en 1908, pp. 29-31, Ministère des Colonies, Paris, 1910.

German East Africa

JAEGER, DR. FRITZ. Das Hochland der Riesenkrater und die umliegenden Hochländer Deutsch-Ostafrikas. Ergebnisse einer amtlichen Forschungsreise ins abflusslose Gebiet des nördlichen Deutsch-Ostafrika 1906/07. Teil I: Aufgaben und Verlauf—Die Karte—Ergebnisse der Sammlungen—Ethnographisches. *Mitt.* Deutsch. Schutzgebieten, Ergänzungsheft No. 4, 1911, 133 pp., Maps, Diagrams and Ills., Berlin.

German Southwest Africa

RANGE, DR. PAUL. Das Lüderitzland. Maps and Ills. *Mitt.* Deutschen Schutzgeb., 24 Band, 1 Heft, 1911, pp. 30-42.

Italian Somaliland

RENTY, E. DE. Un chemin de fer dans la Somalie italienne. Map. *Renseign. Col.*, Vingt et Unième Année, No. 3, 1911, pp. 61-63.

Nigeria

—— The Mineral Survey of Southern Nigeria. *Scott Geogr. Mag.*, Vol. XXVII, No. 1, 1911, pp. 34-36.

The Nile

LYONS, CAPT. H. G. The Valley of the Nile. *Scott Geogr. Mag.*, Vol. XXVII, No. 5, 1911, pp. 257-260.

Rhodesia

BRUNNTHALER, JOSEF. Die Viktoriafälle des Sambesi und ihre Umgebung. Map and Ills. *Deutsche Rundsch. für Geogr.*, XXXIII Jahrg., 8 Heft, 1911. pp. 371-376.

HAHN, PROF. PAUL DANIEL. A Geyser in South Africa [Rhodesia]. Ill. *South Afric. Journ. of Sci.*, Vol. VII, No. 6, 1911, pp. 240-241, Cape Town.

Sahara

CAIX, ROBERT DE. La question du Tibesti. *L'Afrique Franç.*, Vingt et Unième Année, No. 3, 1911, pp. 88-92.

ZIMMERMANN, M. Le Sahara Soudanais. *Bull.* Soc. Géogr. de Lyon, 2e Série, Tome IV, Fasc. 1, 1911, pp. 21-51.

Sierra Leone

ALLDRIDGE, T. J. Sierra Leone and Its Commercial Expansion. Ills. *United Empire*, Vol II, (New Series) No. 5, 1911, pp. 317-324.

Southwest Africa

PEARSON, H. H. W. On the Collections of Dried Plants obtained in South-West Africa by the Percy Sladen Memorial Expeditions, 1908-1911 (Report No. 5). *Annals* South African Mus., Vol. IX, 1911, 19 pp., and map.

Swaziland

DAVIS, R. A. Fruit Culture in Swaziland. *Agric. Journ.* of South Africa, Vol. I, No. 1, 1911, pp. 99-101, Pretoria.

ASIA

MACHAČEK, DR. FRITZ. Fortschritte der geographischen Forschungen in Asien im Jahre 1910. *Deutsche Rundsch. f. Geogr.*, XXXIII Jahrg., 8 Heft, 1911, pp. 377-380.

Annam

VASSAL, MADAME GABRIELLE M. Life in Annam. Ills. *Journ.* of Manchester Geogr. Soc., Vol. XXVI, Part II, 1910, pp. 51-66.

Asiatic Russia

—— Baumwollernte 1910 in Mittelasien. *Tropenpfl.*, 15 Jahrg., No. 5, 1911, p. 278.

Asiatic Turkey

HOLZMANN, M. Syrische Städtebilder. III. Aleppo. *Deutsch. Rundsch. für Geogr.*, XXXIII, Jahrg., 8 Heft, 1911, pp. 353-359.

China

LEGENDRE, A. Explorations dans la Chine occidentale. (Kien-tch'ang-Lolotie et massif des Oua-pao-chan.) *La Géogr.*. Vol. XXIII, No. 4, 1911, pp. 249-262.

VACCA, PROF. GIOVANNI. Il valore morale del popolo cinese. (Impressioni e riflessioni dopo un viaggio nella Cina Occidentale.) Ills. *Boll.* Soc. Geogr. Ital., Serie IV, Vol. XII, No. 5, 1911, pp. 569-590.

India

GOËS, DR. KARL. Die indischen Grossstädte. Statist. u. Nationalökon. Abhandl., der Univ. München, Heft VII, 1910, 94 pp.

SCHUSTER, MRS. ARTHUR. Sixty Days Marching Through Ladak and Lahoul. Map and Ills. *Journ.* Manchester Geogr. Soc., Vol. XXVI, Part II, 1910, pp. 67-77.

Japan

HANSARD, CAPT. ARTHUR C. Early Days in Japan. *Proc.* U. S. Naval Institute, Vol. 37, No. 1, 1911, pp. 141-156, Annapolis, Md.

NAKAMURA, S. and K. HØNDA. Seiches in Some Lakes of Japan. *Journ.* College of Sci. Imperial Univ. of Tokyo, Vol. XXVIII, Art. 5, 1911, 95 pp., Maps and Ills.

TORII, R. Les Aborigènes de Formosa. Études anthropologiques. (1er Fasc.) *Journ.* College of Sci., Imperial Univ. of Tokyo, Vol. XXVIII, Art. 6, 1910, 17 pp., Map and Ills., Tokyo.

Persia

YATE, LIEUT.-COL. A. C. The Proposed Trans-Persian Railway. *Scott. Geogr. Mag.*, Vol. XXVIII, No. 4, 1911, pp. 169-180.

Philippine Islands

BROOKS, BENJAMIN T. The Natural Dyes and Coloring Matters of the Philippines. *Philipp. Journ. of Sci.*, Vol, V, No. 6, 1910, pp. 439-452, Manila.

Tibet

BACOT, J. A travers le Tibet oriental. Maps and Ills. *La Géogr.*, Vol. XXIII, No. 4, 1911, pp. 241-248.

AUSTRALASIA AND OCEANIA

Australia

ANDREWS, E. C. Geographical Unity of Eastern Australia in Late and Post Tertiary Time, with Applications to Biological Problems. Repr. from *Journ.* and *Proc.* of the Royal Soc. of N. S. Wales, Vol. XLIV, pp. 420-480, 1910.

GILL, THOMAS. A Biographical Sketch of Colonel William Light, The First Surveyor-General of the Province of Australia. Royal Geogr. Society of Australasia (South Australian Branch), Supplement to Vol. XI, 1911, pp. 81-177, Adelaide.

—— A Brief Journal of the Proceedings of William Light, Late Surveyor-General of the Province of South Australia: with a few Remarks on some of the Objections that have been made to them. *Royal Geogr. Soc.* of Australasia (South Australian Branch), Supplement to Vol. XI, 1911, pp. 1-80, Adelaide.

Dutch New Guinea

LORENTZ, H. A. An Expedition to the Snow Mountains of New Guinea. Map and Ills. *Geogr. Journ.*, Vol. XXXVII, No. 5, 1911, pp. 477-500.

—— De Wetenschappelijke uitkomsten der Mamberamo-Expeditie 1909-10. Map. *Tijdsch.* Kon. Nederl. Aardrijkdk. Genootsch., Tweede Serie, Deel XXVIII, No. 3, 1911, pp. 448-461.

New Caledonia

—— Statistiques de l'industrie minière dans les colonies françaises pendant l'Année 1908. La Nouvelle Calédonie, exploitation du Chrome, de 1900 à 1908, p. 14, du Cobalt, p. 15, du Nickel, p. 17, Ministère des Colonies, Paris, 1910.

New Zealand

CAFRA, GIUSEPPE. La Nuova Zelanda. (Una Italia Australe.) Ills. *Boll.* Soc. Geogr. Ital., Serie IV, Vol. XII. No. 5, 1911, pp. 591-618.

SCHOLEFIELD, GUY H. The Origins of the New Zealand Nation. *United Empire*, Vol. II (New Series), No. 5, 1911, pp. 303-316.

EUROPE

BREHM, DR. V. Der Einfluss glazialer und postglazialer Verhältnisse auf die niedere Tierwelt Mitteleuropas, speziell auf deren geographische Verbreitung. *Deutsche Rundsch. f. Geogr.*, XXXIII Jahrg., 8 Heft, 1911, pp. 359-371.

Adriatic Sea

BRÜCKNER, PROF. DR. ED. Vorläufiger Bericht über die erste Kreuzungsfahrt S. M. S. *Najade* in der Hochsee der Adria 25 Februar bis 7 März 1911. Maps and Diagrams. *Mitt.* k.k. Geogr. Gesellsch. in Wien, Bd. 54, No. 4, 1911, pp. 192-226.

GRUND, PROF. DR. ALFRED. Die italienisch-österreichische Erforschung des Adriatischen Meeres. Die ozeanographische Probefahrt S. M. S. *Najade* (25. 2. bis 7. 3. 1911). *Zeitsch.* Gesellsch. f. Erdk. zu Berlin, 1911, No. 4, pp. 262-268.

Denmark

MORRILL, W. J. Fixation of the Dunes on the Coast of Jutland. *Forestry Quart.*, Vol. IX, No. 1, 1911, pp. 62-67, Cambridge, Mass.

France

BRIQUET, A. Sur la morphologie de la partie médiane et orientale du Massif Central. Maps and Profiles. *Ann. de Géogr.*, XX^e Année, No. 103, 1911, pp. 30-43, and No. 110, pp. 122-142.

CHAUVIGNÉ, AUGUSTE. Topographie gallo-romaine de la Touraine. Map. *Bull.* Géogr. Hist. et Descrip.. Année 1910, No. 3, Min. de l'Instruction Publique et des Beaux-Arts, pp. 394-409, Paris, 1911.

DUFFART, CHARLES et FRANÇOIS BERGERON. Les Dunes Continentales de Moret-Sur-Loing, front oriental de la forêt de Fontainebleu. Map. *Bull.* Géogr. Hist. et Descrip., Année 1910, No. 3, Min de l'Instruction Publique et des Beaux-Arts, pp. 372-379, Paris, 1911.

GALLOIS, L. Sur la Crue de la Seine de Janvier 1910. *Ann. de Géogr.*, XX^e Année, No. 110, 1911, pp. 112-121.

LAURENT, GUSTAVE. L'Armagnac et les pays du Gers. *Annal. de Géogr.*, XX^e Année, No. 110, 1911, pp. 143-154.

PAWLOWSKI, AUGUSTE. L'Île d'Yeu à travers les âges, d'après la géologie, la cartographie et l'histoire. *Bull.* Géogr. Hist. et Descrip., Année 1910, No. 3, Min. de l'Instr. Pub. et des Beaux-Arts, pp. 380-393. Paris, 1911.

VILLEPELET, FERDINAND. Un syndicat de Navigation à Périgueux pour la Rivière de L'Isle en 1520. *Bull.* Géogr. Hist. et Descrip., Année 1910, No. 3, Min. de l'Instruction Publique et des Beaux-Arts, pp. 363-371. Paris, 1911.

Italy

BRUCK, DR. WERNER FRIEDRICH. Studien über den Hanfbau in Italien. *Tropenpfl.*, 15 Jahr., 1911, No. 4, and No. 5, pp. 244-264.

CORA, GUIDO. Da Trento al Brennero. Estratto dall'Archivio per l'Alto Adige, anno III, fasc. IV, 5 pp., Trento, 1908.

——— Relazione sui servizi dell' emigrazione per l'anno 1909-1910. *Boll.* dell' Emigrazione, Anno 1910, N. 18, Min. degli Affari Esteri, 582 pp., Rome.

The Netherlands

DUBOIS, EUG. De Hollandsche Duinen, Grondwater en Bodemdaling. Map and Ills. *Tijdsch.* Kon. Nederl. Aardrijksk. Genootsch., Tweede Serie, Deel XXVIII, (1911), No. 3, pp. 395-407.

Russia

PIETUKHOFF, N. *Kolonisty Novoi Ziemli* [Colonists of Novaya Ziemla in 1910]. *Ziemleviedienye.* Vol. 17, No. IV, 1910, pp. 42-55, Moscow, 1911.

ROTTMANN, HANS. Die murmanische Küste. *Geogr. Zeitsch.*, 17 Jahrg., 4 Heft, 1911, pp. 222-228.

SEMENOV TIAN-CHANSKII, VENIAMIN. Ville et village dans la Russie d'Europe. [In Russian], *rev. Annal. de Géogr.*, XX^e^ Année, No. 110, 1911, pp. 179-181.

——— Geological and Mineralogical Annual of Russia. [In Russian.] Vol. XII, livr. 7-8, 1910, pp. 189-316, Diagrams and Ills.

Spain

BRIET, LUCIEN. Barrancos et Cuevas. Maps, Ills. and Diagrams. *Spelunca*, Tome VIII, No. 61, 1910, pp. 3-65, Paris.

Sweden

FERNOW, B. E. The Swedish Forest Conservation Law. *Forestry Quart.*, Vol. IX, No. 1, 1911, pp. 59-61, Cambridge, Mass.

FOERSTER, MAX H. Some Facts on Forestry Conditions in Sweden. *Forestry Quart.*, Vol. IX, No. 1, 1911, pp. 45-58, Cambridge, Mass.

RABOT, CHARLES. Le recul du pin sylvestre dans les montagnes de la Suède. Maps and Ills. *La Géographie*, Vol. XXIII, No. 4, 1911, pp. 270-276.

Turkey

HUNTINGTON, ELLSWORTH. Physical Environment as a Factor in the Present Condition of Turkey. *Journ.* of Race Development, April, 1911, pp. 460-481, Worcester, Mass.

United Kingdom

MELLISH, HENRY. The Present Position of British Climatology. Diagram and Bibliogr. *Quarterly Journ.*, Royal Meteor. Soc., Vol. XXXVII, No. 158, 1911, pp. 105-124, London.

POLAR REGIONS

Antarctic

CHARCOT, DR. J. B. Le "Pourquoi Pas?" dans l'Antarctique (1908-1910). Map. *Bull.* Soc. Géogr. de Lille, Tome 55, No. 4, 1911, pp. 221-230.

——— Relaciones Preliminares de los Trabajos ejecutados en la Antártica por la misión á órdenes del Dr. Charcot 1908-1910. Map and Ills. *Bol.* Inst. Geogr. Argentino, Tomo XXIV, Num. 1 á 12, pp. 67-192, Buenos Aires.

Arctic

ISACHSEN, GUNNAR. Die Eisverhältnisse an den Küsten Spitzbergens sowie im Ost- und Westeise 1910. *Pet. Mitt.*, 57 Jahrg., Mai-Heft, 1911, pp. 241-243.

ECONOMIC GEOGRAPHY

VINCENT, HARRY. Bamboo Pulp as the Paper Material of the Future. Ills. *Amer. Forestry*, Vol. XVII, No. 6, 1911, pp. 343-347.

——— Le Thé. Les Principaux Centres de Production. *Bull.* Soc. Géogr. de Lille, Tome 55, No. 4, 1911, pp. 230-234.

HOBBS, WILLIAM H. Repeating Patterns in the Relief and in the Structure of the Land. Reprinted from the *Bull.* Geol. Soc. of America, Vol, 22, May, 1911, pp. 123-176, Maps. Ills. and Diagrams.

HOBBS, WILLIAM H. Requisite Conditions for the Formation of Ice Ramparts. Maps. Reprinted from *Journ. of Geol.*, Vol. XIX, No. 2, 1911, pp. 157-160.

PARKINS, A. E. Valley Filling by Intermittent Streams. Map and Ills. *Journ. of Geol.*, Vol. XIX, No. 3, pp. 217-222.

PHYSICAL GEOGRAPHY

BAUER, L. A. The Physical Theory of the Earth's Magnetic and Electric Phenomena.—No. IV. On the Origin of the Earth's Magnetism. *Terr. Magn. and Atmosph. Electr.*, Vol. XVI, No. 2. 1911, pp. 113–122.

CHAMBERLIN, THOMAS C. and ROLLIN T. CHAMBERLIN. Certain Phases of Glacial Erosion. Ills. and Diagrams. *Journ.* of Geol.. Vol. XIX, No. 3, 1911, pp. 193–216.

EVERDINGEN, DR. E. VAN. Drachenbeobachtungen an Bord I. Ms. Pantzerschiff "de Ruyter," angestellt vom Marineleutnant A. E. Rambaldo während der Fahrt nach Ost-Indien und während des Aufenthalts in W.-Indien, Dez. 1908–Juli 1909. *Mededeelingen en Verhandel.*, II., Kon. Ned. Meteor. Inst., No. 102, 1911, 36 pp. and diagram, Utrecht.

HJORT, JOHAN. The "Michael Sars" North Atlantic Deep-Sea Expedition, 1910. Maps, Ills. and Diagrams. *Geogr. Journ.*, Vol. XXXVII, 1911, No. 4, pp. 349–377, and No. 5, pp. 500–523.

OTHER ACCESSIONS

AUGUST, 1911

AMERICA

(The size of books is given in inches to the nearest half inch.)

AUDIBERT, ALEJANDRO. Cuestión de Límites entre el Paraguay y Bolivia. Artículos publicados en "La Democracia" y en "El Pueblo" por el ———. (Map.) Escuela Tip. Salesiana. Asunción, 1901, 9 x 6. Gift.

BINGHAM, HIRAM. The Ruins of Choqquequirau (Pamphlet reprinted from the American Anthropologist, N. S. Vol. XII, No. 4). The New Era Printing Co. Lancaster, 1911. 10 x 6½. Gift.

BRANSFORD, J. F. Archæological Researches in Nicaragua. (Ills.) Smithsonian Institution. Washington, 1881. 13 x 9½.

ROSSE, IRVING C.; MUIR, JOHN, et al. Cruise of the Revenue-Steamer Corwin in Alaska and the N. W. Arctic Ocean in 1881. Notes and Memoranda, Washington, Government Printing Office. 1883. 12 x 9.

WILSON, WILLIAM BENDER. From the Hudson to the Ohio. (Ills.) Kensington Press. Philadelphia. 1902. 9½ x 6. Gift.

——— Catálogo del Archivo de la Real Audencia de Santiago. Tomo Primero. Litografía y Encuadernación Barcelona. Santiago de Chile, 1898. 9½ x 6. Gift.

ASIA

BRANDSTETTER, RENWARD. Gemeinindonesisch und Urindonesisch. VIII. Monographien zur Indonesischen Sprachforschung. Beilage zum Jahresbericht der Kantonsschule Luzern. 1911. (Pamphlet) 9½ x 6½. Gift.

——— Statistical Report on Formosa, Japan. Printed entirely in the Japanese Language. The Formosan Government, Taihoku, Formosa, Japan. [1911?] Gift. 10½ x 7.

GENERAL

FRIES, TH. M. Bref och Skrifvelser af och till Carl von Linné. Första Afdelningen. Del IV, 1910. Del V, 1911. (Two vols.) 1741 to 1776. Aktiebolaget Ljus (For the University of Upsala), Stockholm. 10 x 6½. Gift.

GOTTFRIED (JOH. LODEW. Historische Kronyck, Grootlycks Vermeerderd en Verbeeterd. In Vier Stucken. (Map and numerous copper-plate engravings.) Pieter Vander Aa, Boeckverkoper, Te Leyden MDCCII. 18 x 11. Gift.

GUEUDEVILLE, [NICOLAS]. Atlas Historique ou Nouvelle Introduction à l'Histoire, . . . etc. Représentée dans de Nouvelles Cartes . . . par Mr. C***. Avec des Dissertations sur l'Histoire de chaque Etat, par Mr. ———, (Maps and ills.), François L'Honore & Compagnie, A Amsterdam MDCCV. 18 x 11. Gift.

PULS, ERNST. Vergleichende Untersuchungen über Flussdichte. Inaugural-Dissertation zur Erlangung der Doktorwürde der hohen philosophischen Fakultät der Kgl. Christian-Albrechts-Universität zu Kiel vorgelegt von ——— aus Hamburg. J. Heinrich Luhrs, Hamburg, 1910. 9 x 5½. Gift.

——— A Chronological and Historical Account of the most Memorable Earthquakes that have happened in the World, from the Beginning of the Christian Period to the present Year 1750. With an Appendix containing a distinct Series of those that have been felt in England. . . . By a Gentleman of the University of Cambridge. . . . Printed by J. Bentham, Printer to the University . . . Cambridge, MDCCL. 7½ x 4½.

(Bound in the same volume) A Letter concerning Earthquakes written in the year 1693 . . . by John Flamstead, and a Letter from the Lord Bishop of London. (MDCCL.)